IceSked

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Newsletter of the Antarctic Research Centre
Victoria University of Wellington

A Word From the Director

In this issue we say good-bye to Centre Manager, Tamsin Falconer after eight years with the ARC, profile Nancy Bertler's Roosevelt Island ice coring programme and highlight the research projects of some of our graduate students. We also acknowledge the support from our Endowed Development Fund which is extremely important to maintaining the ARC's student research programmes, and ask you to consider a future donation.

Tim Naish

Roosevelt Island Climate Evolution (RICE) Project

During the 2010/11 Antarctic field season, the Roosevelt Island Climate Evolution (RICE) Project www.victoria.ac.nz/antarctic/research/research-prog/rice/ successfully completed its first field season. RICE is a collaboration between New Zealand, USA, Denmark, Germany, United Kingdom, Australia, and Italy, and aims to retrieve a 750 m deep ice core from Roosevelt Island to determine the stability of the Ross Ice Shelf in a warming world, thus improving estimates of future Antarctic contributions to sea level rise.

The motivation for this project comes from the observed warming of Antarctica and the Southern Ocean. One of the most dramatic responses to increasing temperature has been the recent catastrophic disintegration of ice shelves. While ice shelf collapse does not cause sea level to rise (ice shelves already float in the ocean), their loss accelerates the flow of ice from the continent into the ocean, which does raise sea level. RICE will investigate the Ross Ice Shelf retreat over the past 20,000 years. Then, global average temperatures recovered from the last ice age and rose by ~6°C, while sea level increased by 120 m. Only when the large Northern Hemisphere ice sheets had melted about 8,000 years ago and global sea level had stabilised, did the Ross Ice Shelf grounding line retreat over 1,000 km. We expect the RICE ice core to provide an annually resolved record, which will allow us to correlate highly resolved reconstructed climate conditions with the precisely dated retreat history. Through modelling, we can then project threshold conditions and rates of further ice shelf retreat, and West Antarctic Ice Sheet collapse.

In preparation for the drilling seasons, Antarctica New Zealand and US Polar Programmes supported the NZ/USA/UK team to complete the site survey during this past field season. The New Zealand group deployed an automatic weather station, retrieved five 10 m deep firn cores, collected almost 1,000 snow samples, and winterised over 50,000 lbs of equipment and fuel for next year's drilling operation. At the same time, the US/UK team was busy traversing the island with high resolution radar surveys, and establishing a 200 km array of mass balance devices. Much to our delight, weather conditions were relatively calm (albeit foggy), and we were repeatedly visited by a flock of curious snow petrels. Freshly baked bread and oven roasts kept the group cosy even through the coldest of evenings.

Back in New Zealand, our new Intermediate Depth Ice Core Drilling system, modelled after the Danish Hans Tausen Drill, is almost ready for its maiden deployment during the coming field season. During May, a RICE Science Workshop was held at the University of Washington, Seattle, to finalise the RICE science teams, sample allocation, and core processing schedules, which will be carried out at the New Zealand Ice Core Research Laboratory at GNS Science. In October, a team of 15 will deploy to Roosevelt Island to commence the drilling, hoping for good weather, excellent core, and perhaps a few more curious visitors.

Nancy Bertler
RICE Chief Scientist

RICE headquarters, Roosevelt Island

JARI Past Antarctic Climates Workshop

The Joint Antarctic Research Institute (JARI) and GNS Science hosted a two day workshop between 6-7 April, which saw Antarctic paleoclimate researchers from NIWA, GNS Science, Otago, Canterbury, and Victoria universities, come together to present latest results and discuss future research directions and priorities. The workshop was ably convened by Richard Levy (GNS Science) with the support of Lionel Carter and Nancy Bertler (ARC). The workshop provided an opportunity for the larger multi-institutional FRST funded programmes such as ANDRILL, ANZICE (Antarctica-New Zealand Interglacial Climate Extremes), Ice Coring (Global Change through Time), and Sea Ice to highlight achievements as well as other more independent researchers to show how their research is aligned to some of the high-priority goals outlined in the new Antarctic-Southern Ocean research strategy. A successful evening session for stakeholders (funders and end-users) was held profiling some of the research outcomes and their importance for the Intergovernmental Panel on Climate Change's 5th Assessment Report. Richard, Lionel, Tim Naish and Andrew Mackintosh (ARC) presented to the workshop and representatives from the Ministry of Foreign Affairs and Trade, Ministry of Science and Innovation, Ministry for the Environment, and the Climate Change Research Institute. An exciting planning session for future research directions focussed on the need for more data to validate models of past "warmer-than-present" climates and the impact of polar temperature amplification on the Antarctic ice sheets and climate system as the Earth continues to warm.

SIRG delegates explore Fox Glacier

SIRG in Fox Glacier

The New Zealand Branch of the International Glaciological Society, known locally as the Snow and Ice Research Group (SIRG) www.sirg.org.nz/ held its annual meeting in Fox Glacier between 9-11 February. The conference was organised by PhD student Alice Doughty (ARC) with assistance from Katrin Sattler (SGEES) and Karen McKinnon (ARC). Along with sessions on *Glacier behaviour and dynamics, Fox and Franz Josef Glaciers, Antarctica, Modelling and Climate and permafrost*, there was also a public lecture *'Glaciers in our backyard'* which featured the perspectives of three West Coast people; Cornelia Vernoorn from the Department of Conservation who manages ~7,000 visitors to the glacier each day; Graham Wilcox, who guides tourists on the glacier and assists scientists in monitoring ablation, and Brian Anderson, an ARC glaciologist, who monitors mass balance on the Fox and Franz Josef Glaciers with an interest in modelling the interactions between glaciers and climate.

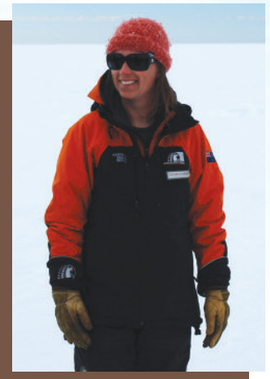
The meeting was attended by 50 participates from six countries representing 13 institutions: NIWA, Victoria, Otago, Canterbury, and Massey universities from New Zealand and international scientists from the University of Fribourg (Switzerland), Swiss Federal Institute for Snow and Avalanche Research (Switzerland), Bristol Glaciology Centre (UK), University of Victoria (Canada), University of Washington (USA), University of Alaska, Fairbanks (USA), University of Queensland (Australia), and Curtin University (Australia). The majority of participants walked on the glacier, some of whom were walking on a glacier for the first time, and inspected and debated the origin of surface features such as ice pressure arches, conduits, crevasses, entrained debris and ice foliation.

Andrew Mackintosh and Alice Doughty

A Fond Farewell

The ARC's Centre Manager, Tamsin Falconer, resigned in April after almost eight years of service. During this time, Tamsin was instrumental in steering the ARC through rapid growth and setting-up the Science Drilling Office (SDO). She worked closely with SDO's Director, Alex Pyne, as Project and Business Development Manager. Her many achievements include coordinating the development of a Project Plan for the next phase of the ANDRILL Program's drilling on the Ross Ice Shelf at Coulman High, which she presented to international partners in Buenos Aries last August. She was also Project Coordinator of the highly successful Coulman High drill site surveys this season, overseeing an international team making hot-water access holes through the ice shelf to deploy oceanographic moorings and recover sea-floor sediment cores.

At her leaving function attended by friends, colleagues and stakeholders, both Peter Barrett and I remarked on the incredible evolution of Tamsin in her time at the ARC. When Tamsin joined us in 2003 the ARC was small consisting of Peter Barrett, Alex Pyne, and a couple of post-docs and students. She had returned from her OE holding a bachelors degree in architecture, having a penchant for museums and wondering where life might take her. Admittedly Antarctica was already in the Falconer family blood with her father Robin visiting by ship many years earlier, then Tamsin heading there herself with Gateway Antarctica, and all involved in the New Zealand Antarctic Society, where Tamsin held a committee position for many years. Tamsin witnessed and contributed to the growth of the ARC from those small beginnings to the large family it is today. Not only did this quietly-spoken efficient organiser become an aficionado with University finances, handling many complicated research contracts, she oversaw the shift and refurbishment of our current premises on the 5th floor of Cotton building, became adept at managing stakeholder relationships and functions, contributed to outreach and education in schools, and also developed an interest and expertise in scientific drilling and engineering! Last year Tamsin's outstanding contribution was recognised through a University General Staff Team Excellence Award.



Tamsin Falconer Coulman High, Antarctica

Under Alex's expert guidance Tamsin provided critical support for the drilling operations during ANDRILL's first drilling seasons, spending three long summers in Antarctica between 2005-2008 as assistant to the Drill Site Manager, and just like her role back here she provided the "glue" that kept the operation running smoothly and successfully. The only blemish on her otherwise spotless record was when she directed Alex to drive the Hagglunds vehicle out of the field centre at Scott Base. Unfortunately the garage door was not all the way up and Alex tore it off! Late that night there was a special request on Scott Base radio for "The Doors" song "Break on through to the other side"!

Tamsin developed considerable skills in project management which she now combines with her interests in museums in her new position at Museums Wellington. We will miss Tamsin's "steady as she goes" good humoured approach and her enthusiasm for our science and broader activities. Together with Peter, Alex, Michelle Dow (ARC Administrator), and the rest of the ARC team we wish Tamsin well for the future. *Tim Naish*

The ARC Management Team, (L-R): Tim Naish, Alex Pyne, Peter Barrett, Michelle Dow and Tamsin Falconer at Tamsin's farewell

Marine Core Fossils and Climate

After completing a masters degree at Victoria University in 2005, studying fossil pollen and algae from the Antarctic margin, one of my lingering unanswered questions was "how can we actually work out temperature from fossil assemblages?" Perhaps not a question that keeps most people awake, but one that intrigued me! So with this, and other questions in mind, I have returned to the ARC, this time to a PhD that aims to reconstruct climate of the New Zealand region during a warm interglacial 400 thousand years ago. During this time, global temperature was slightly warmer (1-2°C) than the present day.

"Night shift on the *Tangaroa*" *Joe Prebble washes sea floor sediment samples on board NIWA's research vessel*

This type of study helps our understanding of the range of climatic variability within pre-industrial green house gas levels, so provides a point of comparison both to projections of future warming, and to times of elevated greenhouse gasses in the geological past when temperatures were also higher than present. By comparing the distribution of modern marine algae to fossil algae from sediment cores, I can infer sea surface temperature during the time the marine algae grew. Having answered my first question about how to actually reconstruct environmental conditions from fossil assemblages, our initial results show that during our study period, peak sea temperatures along South Island's West Coast were up to 3-4°C warmer than present.

My PhD is supervised by Prof. Lionel Carter (ARC) and Dr's Erica Crouch and Giuseppe Cortese (GNS Science), and is supported by the ANZICE programme. *Joe Prebble*

Modelling the Shape of Ancient Glaciers

I am in the final year of my PhD, supervised by Dr's Andrew Mackintosh and Brian Anderson (ARC) with funding by the New Zealand International Research Doctoral Scholarship. I travelled from Maine, USA, where I studied New Zealand's past climate and glacial history before moving to Wellington to be closer to my field area and gain a better understanding of how New Zealand glaciers behave today to help interpret their past. My research focuses on the climate 13,000 years ago, when New Zealand was half-way between an ice age and present-day conditions. At this time, glaciers in the Southern Alps stopped retreating, re-advanced slightly, and deposited moraines. These moraines show how big the glaciers were at that time. The bulk of my research is trying to model the shape of the ancient glaciers using modern climate by decreasing the temperature (or increasing the precipitation) enough to 'grow' the glaciers out to a moraine. The end result is a range of possible past climates, which is important in determining what caused the event. During my fieldwork I have been fortunate enough to visit Brewster, Franz Josef, Fox, Rolleston, Mangatoetoenui, Whanaehu and Cameron glaciers as well as Annette Plateau - this project has been an amazing experience for me!

Alice Doughty

Alice Doughty on Cameron Glacier, South Island, New Zealand

OTHER ACTIVITIES

Marsden Second Round

Congratulations to Brian Anderson, Nick Golledge and Andrew Mackintosh, who have succeeded in making it through to the 2nd round of Marsden Fund. Both Brian and Nick have a FastStart proposal while Andrew is applying for a full Marsden grant.

Heather Purdie and Andrew Mackintosh

Rebecca O'Donnell and Andrew Mackintosh

Mike Hannah, Matt Ryan and Gavin Dunbar

Graduations and Completions

The Science Faculty graduation in May saw three of our students receive their degrees,

Heather Purdie was awarded a PhD in Physical Geography for her thesis *"Controls on spatial and temporal variation in snow accumulation on glaciers in the Southern Alps, New Zealand"*. Supervised by Andrew Mackintosh, Brian Anderson and Assoc. Prof. Wendy Lawson (University of Canterbury).

Rebecca O'Donnell awarded an MSc in Physical Geography with First Class Honours for her thesis *"Modelling Quaternary glacier extent and climate in Tasmania, Australia"*. Supervised by Andrew Mackintosh, Nick Golledge and Dr Alun Hubbard (University of Wales, Aberystwyth).

Matt Ryan awarded his MSc thesis *"A palynological record of the vegetation and climate of Westland since 210 ka"*. He was supervised by Gavin Dunbar and Mike Hannah (SGEES).

Other recent thesis completions include:

Annette Bolton (PhD) *"LA-ICP-MS trace element analysis of planktonic foraminifera and application to Marine Isotope Stage 31 in the Southwest Pacific Ocean"*. Supervised by Joel Baker (SGEES) and Lionel Carter.

Rachael Rhodes (PhD) *"Insights into Late Holocene climate of the Ross Sea region, Antarctica, from high resolution ice core chemistry"*. Supervised by Nancy Bertler and Joel Baker (SGEES).

Jeremy Fyke (PhD) *"Simulation of the global coupled climate/ice sheet system over millennial timescales"*. Supervised by Lionel Carter, Andrew Mackintosh, and Prof. Andrew Weaver (University of Victoria, Canada).

Lawrence Kees (MSc) *"Assessment of a snow storage gradient across a maritime mountain environment; a Ground Penetrating Radar investigation"*. Supervised by Brian Anderson and Andrew Mackintosh.

Brad Markle (MSc) *"Dominant synoptic controls and influence of decadal climate oscillations in the Ross Sea region, Antarctica"*. Supervised by Nancy Bertler and Joel Baker (SGEES).

Rory Mearns (MSc) *"Marine palynomorphs from the Plio-Pleistocene interval of the AND-1B Drill-Core McMurdo Sound, Antarctica"*. Supervised by Mike Hannah (SGEES) and Tim Naish.

Karen McKinnon (MSc) *"The role of climate and bed topography on the evolution of the Tasman Glacier since the Last Glacial Maximum"*. Supervised by Andrew Mackintosh and Brian Anderson.

Matt Stevens (MSc) *"Miocene and Pliocene silicic Coromandel Volcanic Zone tephras from ODP Site 1124-C: Petrogenetic applications and temporal evolution"*. Supervised by Lionel Carter and Joel Baker (SGEES).

Stephen Stuart (MSc) *"Observations and modelling of precipitation in the Southern Alps of New Zealand"*. Supervised by Andrew Mackintosh and Sam Dean (NIWA).

Evelien van de Ven (MSc) *"Sedimentology and zircon geochronology of the CIROS-1 drill core, Ross Sea, Antarctica"*. Supervised by Tim Naish and Joel Baker (SGEES).

Supporting the Antarctic Research Centre

In 2004 the Antarctic Research Centre launched an Endowed Development Fund Appeal to provide funds for students to undertake research in Antarctica, and for emerging research opportunities. Thirty-seven students have so far been awarded grants from the Fund for field work in Antarctica, conference attendance, and travel for collaborative work at other institutions.

We urge you to consider supporting the Fund, either through a monthly automatic payment, or through a gift in your will, which is a tremendous way to show support while not impacting on your financial needs during your lifetime. For support options please refer to: www.victoria.ac.nz/antarctic/about/endowments/endowed-development-fund-donors.aspx All donations are made through the Victoria University Foundation, a registered charity, and are therefore eligible for a charitable gift taxation rebate.

For further information on how you can provide philanthropic support to the Antarctic Research Centre, please contact our Director, Professor Tim Naish, Email: timothy.naish@vuw.ac.nz, or Diana Meads, Development Manager - Planned Giving, Ph: 0800 VIC GIFT (0800 842 4438), Email: diana.meads@vuw.ac.nz

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