THE ANTARCTIC RESEARCH CENTRE

OTHER ACTIVITIES

The Antarctic Research Centre Endowed Development Fund: Supporting the Next Generation of Antarctic Scientists

In 2004 the Antarctic Research Centre launched an Endowed Development Fund Appeal to provide funds for students to undertake research in Antarctica. The fund has now reached $500,000 with fifty-four grants having been awarded so far. Annually we disburse small grants up to $4000 to 8-10 postgraduate students, which makes an enormous difference and enables some amazing opportunities to be taken up, that would not have otherwise been possible. Examples include: participation in international summer schools in glaciology, modelling and palaeoecology, the opportunity to work with collaborators in world-class analytical facilities, and the ability to travel to international meetings such as the American Geophysical Union meeting and to present their scientific discoveries on the world stage. These opportunities have led to both, our students finding great positions and postdoctoral fellowships overseas, and a number of international students coming to the ARC to undertake postgraduate study. We very much value your support in helping us achieve this important milestone. Planning is currently underway on how we take the Endowed Development Fund to the next level to enable us to continue to support the next generation of Antarctic scientists.

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 Anita McKegg, Development Manager, Ph: 0800 VIC GIFT (0800 842 4438), Email: anita.mckegg@vuw.ac.nz. All donations are made through the Victoria University Foundation, a registered charity, and are therefore eligible for a charitable gift taxation rebate.

Message from a Recipient

In 2007, during my PhD I received support from the ARC Endowed Development Fund to work with Professor Doug MacAyeal (University of Chicago), a pioneer in numerical ice sheet modelling, to develop an understanding of the physics that drive ice sheet simulations. This experience made me realise the need for geological records to provide input (boundary conditions) for such models, as well as being able to evaluate model performance with geological-based palaeoclimate reconstructions. Reflecting on my experience at the University of Chicago years later, being immersed in a truly world-class research group in a field that was outside of my research specialty, provided me with a confidence to integrate model and geological data and interact with researchers from a wide range of disciplines.

Following this visit to Professor MacAyeal’s lab, I was afforded an opportunity to work with other world-leading scientists from New Zealand, the United States, Italy and Germany, as part of the ANDRILL Program, where I became an integral part of the sedimentology team, and as part of my PhD led several interdisciplinary studies on the climate and ice sheet record in the ANDRILL drill core record. Following my PhD, I have worked on other international initiatives, most notably the Integrated Ocean Drilling Program Expedition 318 to Wilkes Land in Antarctica.

Rob McKay

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The main reasons I was keen, and honoured, to make a donation to the Antarctic Research Centre were to acknowledge their enviable record in Antarctic research for nearly 50 years and to support their ongoing research programme and graduate student involvement by also contributing funds to the ARC Endowed Development Fund that provides ongoing support to young Antarctic scientists.

ARC's leading edge research is recognised worldwide and their activities make a significant contribution to our understanding of the Antarctic, climate history and climate change and modelling. Knowing how tough funding gets, it was great to have the opportunity to provide the support and it has been a pleasure to give something back, and make a contribution, to the department that had confidence in and supported me in my graduate student days.

Alan Eggers

A GLOBAL LAUNCH FOR A GLOBAL ISSUE

On Earth Day (22 April), the film Thin Ice: The Inside Story of Climate Change was launched globally in at least 120 countries and on all seven continents, with over 200 organised screenings and 19,000 online views.

This initiative between Victoria University of Wellington, the University of Oxford and DOX Productions, London, was over six years in the making, and takes a fresh look at the changes taking place in the Earth’s atmosphere, oceans and ice sheets. The 73-minute-long documentary gives the public a rare opportunity to see climate scientists at work, talking about what they do, and their hopes and fears.

The Thin Ice project was conceived over a cup of coffee at a climate change conference in March 2006, when the Antarctic Research Centre’s Peter Barrett, suggested to fellow geologist Dr Simon Lamb, then at Oxford University, that he make a film about climate science and scientists with his friend David Sington from DOX Productions. Support from Oxford came through Philip England, then Head of Earth Sciences, with co-production and website development in New Zealand from Dr Adrian Macey, and Associate Professor Marc Wilson.

A feature of the project is the Thin Ice website (www.thiniceclimate.org), which hosts the trailer, and close on 40 video clips taken from the 120 hours of interviews. These expand on key aspects of the film, for those with deeper interests and educators. The website also includes biographies of the scientists and film makers. The website shop has options for purchasing a copy of the film for private and public screenings. There is also a version with subtitles in five different languages including Mandarin, English, Spanish, French, and German. For more information see the website or e-mail ThinIceClimate@vuw.ac.nz
A Science Story - Subglacial Lakes and the WISSARD Project

The last decade has seen an increasing awareness of subglacial lakes and their important role in the hydrologic system beneath ice sheets. Airborne radar and remote sensing methods have now located many hundreds of lakes beneath the Antarctic ice sheets. The significance of subglacial lakes is multifaceted, as they potentially harbour long-isolated biological adapted to the extreme sub-ice-sheet environment, and ii) the distribution of water beneath ice sheets influences the flow of the overriding ice. Some subglacial lakes, such as Subglacial Lake Vostok are large and well known, but smaller lakes now appear ubiquitous and linkages between these lakes have been well demonstrated. A subset of these lakes, termed active lakes, have been observed to fill and drain quickly and are considered especially significant as they have the potential to rapidly introduce water to the ice sheet's bed leading to accelerating ice flow.

In early 2013 Subglacial Lake Whillans became the first active subglacial lake beneath the Antarctic Ice sheet to be directly accessed. The WISSARD Project used newly developed clean access hot water drilling to make a 20 cm diameter hole through the approximately 800 m thick ice allowing water and sediment sampling from this unique environment. Results from this recent work are ongoing, but promise to be excite with preliminary biological analysis indicating traces of life beneath the ice sheet. The WISSARD project continues. This coming season WISSARD will target the downstream end of the drainage of Subglacial Lake Whillans, where it crosses the ice sheet - ice shelf grounding line and enters the ocean cavity beneath the Ross Ice Shelf. The grounding line is a critical zone for ice sheet stability and direct sampling there will undoubtedly lead to exciting scientific discovery.

Antarctica's Glaciers: When and Why did they Melt?

Throughout January, I had measured and sawed rocks, traversed glacier ice and trekked around mountains, often with over 40 kg of samples on my back. As many previous Antarcticans can relate to, I experienced temperatures cold enough to freeze breath to sculpture facial hair, had to dig myself out of my tent on numerous occasions, suffered without a shower or (ever-essential) coffee, and had to get used to a toilet for a few days – why? It was all in the name of science, but I cannot ignore that it was a fun and exciting time too.

Accompanied by Kevin Norton (SGEES) and Chris Fogwill (The University of New South Wales), my business in Antarctica was to investigate how much the Mackay Glacier had melted since the peak of the last ice age (about 20,000 years ago), but also to understand what caused it (rising sea level, or a change in atmospheric and oceanic conditions). We were based on the Antarctic Peninsula, on the island of Livingston, then working all the way to the South Pole at the McMurdo Station. Accompanied by Kevin Norton (SGEES) and Chris Fogwill (The University of New South Wales), my business in Antarctica was to investigate how much the Mackay Glacier had melted since the peak of the last ice age (about 20,000 years ago), but also to understand what caused it (rising sea level, or a change in atmospheric and oceanic conditions). We were based on the Antarctic Peninsula, on the island of Livingston, then working all the way to the South Pole at the McMurdo Station.

A Technological Breakthrough in Ice Coring

The highlight of the recent 2012/2013 field season in Antarctica has been the success of ice core drilling operations in the Ross Sea at Scott Base, led by Nancy Bertler. The Ross Ice Shelf Climate Evolution (RICE) Project is a New Zealand led, nine nation collaboration with partners from Australia, Denmark, Germany, Italy, the People’s Republic of China, Sweden, the United States of America, and the United Kingdom. The projects aim to determine when and how quickly the world’s largest Ice shelf, the Ross Ice Shelf, could collapse allowing warm Antarctic ice to accelerate into the ocean and exacerbate sea level rise.

Richard Jones after a long day walking in unsuitable weather with a pack full of rocks. (Photo: Chris Fogwill)

Richard Jones

Piecing Together the Puzzle: What did Antarctica look like Thousands of Millions of Years Ago?

In October 2012 PhD student Bella Duncan and I went south with members of GNS Science, Otago University, and University of Southampton (UK) to spend a month carrying out scores fieldwork on and around Mt. Discovery, in southern McMurdo Sound, Antarctica. The project was multi-faceted, with some team members investigating the Last Glacial Maximum (LGM; about 18,000 years ago), while others focused on collecting and describing glacial erratics of Eocene age (about 36-54 million years ago). Both teams were attempting to learn something new about the Antarctic continent during these periods of the past, when climates were considerably different from present. By collecting and interpreting microfossils from the Eocene strata, we can inferences make about the climatic conditions at southern high latitudes at a time before the growth of the ice sheet we see today. But mapping the distribution of these (and other) glacial erratics allows us to reconstruct the pattern of ice-flow during the last major extension of the present ice sheet (the LGM), which we can then link to environmental conditions that prevailed at the time. In this way we can begin to see how Antarctica has adapted to changes in atmospheric and oceanic conditions through geological time, helping us to make better predictions for the future. It all sounds quite simple in theory, but getting this information proved more challenging than any

The eight shift team in the drilling tent.

The eight shift team in the drilling tent. (Photo: David Thompson)

Nick Golledge

Nick Golledge looking at one of the glacial erratics.

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of us had expected - throughout the month that we spent on the ice we were continually battered by gale-force katabatic winds, which frequently turned already difficult working conditions into a dangerous white-out. Two of our tents were destroyed, our field gear was continually buried in snow-drifts and sometimes we couldn’t leave camp for days on end. But despite all this we still had a successful season, collecting over 450 kg of rock samples and hundreds of pages of field notes. Now the real work begins, analysing and interpreting the data, and piecing together the puzzle of what Antarctica looked like thousands and millions of years ago.
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In paired papers in Earth and Planetary Science Letters (Horgan et al., 2012 and Christianson et al., 2012) ARC researcher Huw Horgan and colleagues have provided the first comprehensive geophysical survey of an active subglacial lake in the Antarctic. During the 2010/2011 and 2011/2012 field seasons Horgan and colleagues from the US and Italy deployed the first stage of the National Science Foundation sponsored Whillans Ice Stream Subglacial Access Research Drilling (WISSARD) Project. In their subsequent publications the team use seismic and radar techniques to demonstrate that Subglacial Lake Whillans, which lies beneath one of the major ice streams feeding the Ross Ice Shelf, is a perennially shallow feature. Although the ice surface overlying the lake had previously been seen to rise and fall by over 100 m during water pulse events, no previous seismic or radar observations had been reported. As the team had trained their focus on the subglacial lakes, they were surprised when the lake imaged by a borehole camera (Photo: Alberto Behar, NASA) was found to be well connected with the ice sheet.

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