IceSked

Issue 12: June 2009

Newsletter of the Antarctic Research Centre
Victoria University of Wellington

The first half of the year has been a busy time for the ARC. This issue highlights the achievements of ANDRILL through recent publications and introduces the ARC's Science Drilling Office and new Engineer. We report on this year's S.T. Lee Lecture and the research of our new Post-Doctoral Fellow, Nick Golledge and MSc student, Matt Ryan. We also look at two recently published books which are of interest to the ARC.

A Word From the Director

The year got off to a roaring start in January with Nancy Bertler's 2nd year summer course "Climate Change and New Zealand's Future" receiving record student numbers. Also in January, a meeting of the world's leading experts on Earth's past "Greenhouse" climates was hosted by GNS Science in association with Victoria University. More than 60 international scientists attended the ANDRILL McMurdo Ice Shelf Science Integration Workshop at Victoria University in February, to discuss the latest results and publications. In March, we welcomed Darcy Mandeno, the Science Drilling Office's new Field and Operations Engineer, and Nick Golledge, a Post-Doctoral Fellow in glacial modelling. Peter Barrett helped co-ordinate the ANTSCAPE Workshop at the University of Leeds, UK, in April, which saw experts gather to reconstruct Antarctica's paleogeography through time - an important constraint for ice sheet models. ANDRILL results were presented by myself and Rob McKay (ARC) at the European Geophysical Meeting in Vienna and Peter and I enjoyed a visit with Lee Seng Tee, ARC philanthropist, in Singapore on our way home. In May, there was no let up. The annual S.T. Lee Lecture in Antarctic Studies was given by Prof George Denton in conjunction with the "Past Climates Meeting". *Tim Naish*

New Insights into West Antarctic Ice Sheet Behaviour in a Warmer World

In March, new results from the ANDRILL Program, published in *Nature* magazine (Naish et al., 2009; Pollard and DeConto, 2009; Vol 458: 19 March), provide an example of how paleoclimate records integrated with climate and ice sheet modelling can reveal past behaviour of the West Antarctic Ice Sheet as well as provide insights into future changes. The ANDRILL-1B drill core reflects an unstable West Antarctic Ice Sheet during the Pliocene (5-2 million years ago) regularly growing and collapsing during a time when Earth's average surface temperature was ~3°C warmer than present, and oceans around Antarctica were up to ~5°C warmer - driving global sea-level changes of up to +7 m above present.

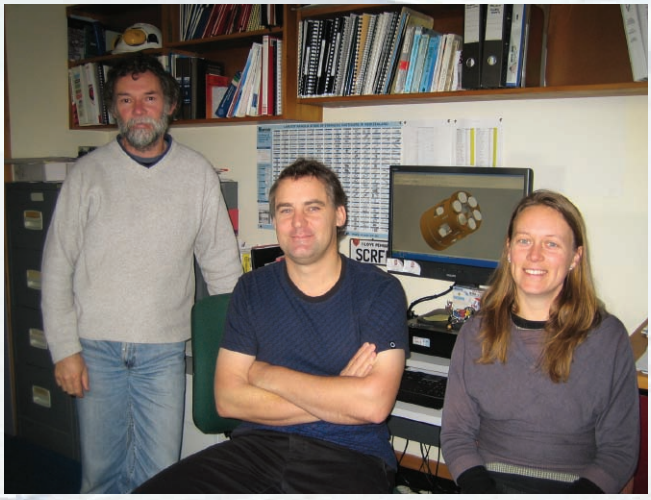
The size of these ice volume changes was a surprise and causes concern as they occurred when atmospheric CO_2 levels were no higher than ~400 ppm, only slightly lower than present day levels. Our research findings support other recent studies of the greenhouse world of ~50 million years ago, implying a higher 'climate sensitivity' than currently accepted. News of the *Nature* papers publication occurred during the ANDRILL Science Integration Workshop in Wellington in February. The McMurdo Ice Shelf Science Team are justifiably pleased, and have a number of equally exciting results in the publication pipeline. *Tim Naish (ARC) & Richard Levy (GNS Science)*

ANDRILL MIS Science Integration Workshop participants at Victoria University, February 2009

Supporting Science with Technology - the Science Drilling Office

Alan Eggers' generous donation in 2007 (see IceSked #9) allowed the ARC to formally establish its Science Drilling Office (SDO) and employ Darcy Mandeno as Field and Operations Engineer. The SDO has been set up to promote ARC expertise in designing, managing and operating drilling technology for scientific projects, and to recognize the important contribution technological innovation has made to our scientific achievements. The SDO builds on 30+ years of experience by Alex Pyne in operating technologies in Antarctic environments, particularly on sea ice. Alex's contribution started with the MSSTS-1 drilling in 1979, continued with other sea ice based sediment coring projects; Cenozoic Investigations of the Ross Sea Project and the Cape Roberts Project, and more recently with shallow and intermediate ice coring and ice-shelf based ANDRILL sedimentary coring. Tamsin Falconer has been involved in supporting ANDRILL and ice core drilling technology development and planning. Darcy brings with him 17 years engineering experience working in various industries including; a pulp and paper manufacturer, a beef processing/refrigeration plant, and lately as a Mechanical Design Draughtsperson and Project Manager for a quarry and mining equipment manufacturer.

The SDO is currently engaged in several projects, including planning for future ANDRILL drilling sites, advice for drilling on the Alpine Fault and the construction of an Ice Core Drilling System.



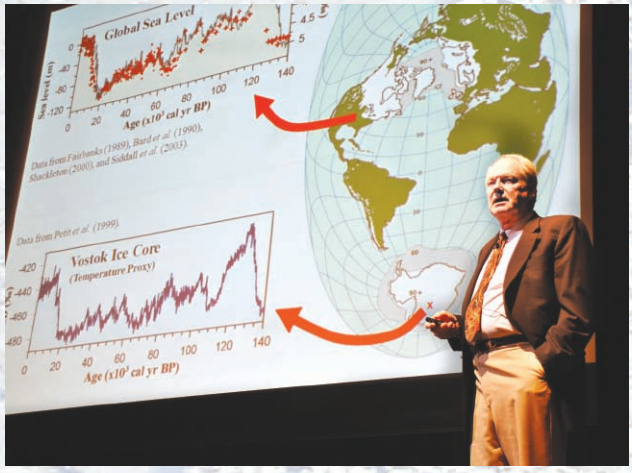
The SDO team; (L-R) Alex Pyne, Darcy Mandeno and Tamsin Falconer

New adjuncts appointed to the ARC

In recognition of their long association and established collaboration with ARC staff we are pleased to announce the appointment of the following new Adjunct positions. Prof Ross Powell (Northern Illinois University), Assoc Prof Terry Wilson (Ohio State University), Dr Stuart Henrys (GNS Science), Dr Richard Levy (GNS Science), Dr Helen Neil (NIWA), Dr Mike Williams (NIWA), and Dr Helen Bostock (NIWA). They join our current adjunct Professors; Peter Webb (Ohio State University), Barrie McKelvey (University of New England), and David Lowe (LoweNZ).

S.T. Lee Lecture in Antarctic Studies and Past Climates Meeting

George Denton, Libra Professor of Earth Sciences, University of Maine, presented this year's S.T. Lee Lecture "*Antarctica and the Ice Age Puzzle*", to a capacity audience on the 15 May. The lecture discussed the role of Antarctica in recent global ice ages, with a particular focus on determining the origin of a warming event between 18,000 and 11,700 years ago, when the southern part of the planet switched from a glacial climate to the interglacial conditions of today. George is a world expert in the geological history of large ice sheets and smaller mountain glaciers and has over 30 years of field experience in Antarctica, New Zealand, and Patagonia. He has a long-standing interest in the timing and mechanisms of abrupt climate change and climatic interaction between the Northern and Southern hemispheres and over the last few years, has collaborated with New Zealand scientists based at GNS Science to produce a series of maps of the South Island, showing a visual representation of the advance and retreat of ice in the area. George's talk can be downloaded from our website at: www.victoria.ac.nz/antarctic/about/Endowments_Donations/lee-lecture



George Denton giving this year's S.T. Lee Lecture

The S.T. Lee Lecture was held in conjunction with the very successful "Past Climates Meeting" organised by Marcus Vandergoes (GNS Science), Giuseppe Cortese (GNS Science) and Helen Bostock (NIWA). The meeting included a one-day symposium, a two-day **INT**egration of **I**ce-core, **MA**rine and **TE**rrestrial records (INTIMATE) workshop, and a public lecture by Prof Wally Broecker (Lamont Doherty Earth Observatory, Columbia University). National and international participants discussed the latest advances in understanding Quaternary past climates in New Zealand and Australia, the causes and effects of climate change in the Southern Hemisphere and the relationships with global climate change. Visit the website: www.paleoclimate.org.nz/pastclimates/index.html

Numerical Modelling of Southern Alps Ice Extent

For the last decade or so I have been working as a field geologist for the British Geological Survey (BGS) in Edinburgh, mapping and interpreting the glacial sediments and landforms left by previous glaciations in the Scottish mountains. My PhD, supervised by Prof David Sugden (Edinburgh University) and Dr Alun Hubbard (University of Wales, Aberystwyth), involved numerical ice sheet modelling to replicate the glacial configuration I'd inferred from field data. This combined empirical and theoretical technique allowed me to make some interesting links between former glacier dynamics and governing climate scenarios, and it is these interrelationships that I am continuing to investigate here at the ARC, but in a Southern Hemisphere context.

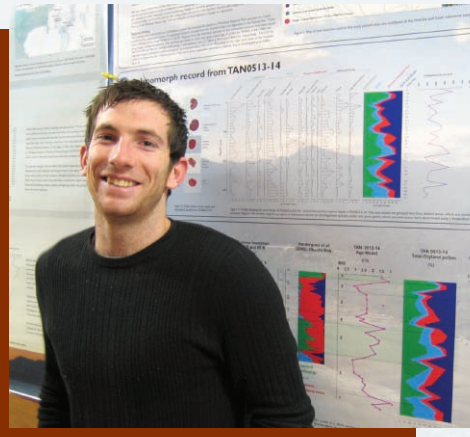
Working with Andrew Mackintosh (ARC/SGEES) and Brian Anderson (ARC) I'm hoping to refine glacier models of the Southern Alps, and explore possible changes in the climatic conditions that prevailed during the last glacial cycle. Our aim is to simulate as closely as possible the empirical landform record in the Southern Alps as mapped in the central South Island glacial geomorphology project (led by Prof George Denton and GNS Science), that is investigating the age and structure of the Last Glacial Maximum (LGM) in the central Southern Alps of New Zealand. Hopefully the modelling will provide further insights into the timing and pattern of deglaciation following the LGM. In the longer term, I am keen to apply the high-resolution modelling technique to parts of Antarctica, and constrain this with geochronological data from fieldwork, since most current Antarctic ice sheet models operate at a scale that is too large to reliably infer aspects of glacier dynamics at the local (kilometre) scale. *Nick Golledge*

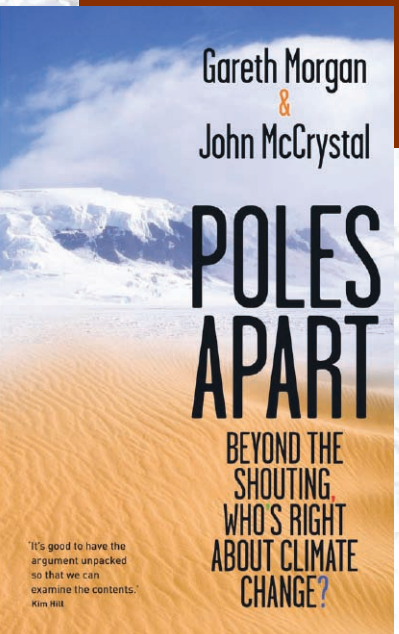
Nick Golledge on Mount Holt, West Antarctica, 2008

Deep Sea Mud – A Key to Past Vegetation and Climate Change

For my MSc research I am using terrestrial pollen and spores ("palynomorphs") that have been washed out to sea and accumulated with deep sea mud to help reconstruct vegetation and climate change over the last 210,000 years. Deep sea mud has the advantage of accumulating slowly and consistently over long periods of time and is easier to date (at least for periods beyond the range of radiocarbon) than lake and swamp deposits and it incorporates marine dinoflagellates.

I have extracted samples from several piston cores collected by the RV *Tangaroa* off the West Coast of South Island, New Zealand. Initial results indicate clear fluctuations in pollen, spores and dinoflagellates over the last 210,000 years with a greater abundance of grassland pollen relative to forest pollen, indicating a cooler climate, occurring during glacial periods. Interestingly, the amount of forest pollen between 125 and 210 thousand years ago was less than present day, suggesting the area of forest may have been less extensive in spite of similar or warmer climatic conditions. At present it is not clear if these changes are driven by climate change, changes in the efficiency of transporting pollen and spores of different sizes and shapes to the core site in response to sea level change, or some combination of both. Future work will focus on improving the age control and sampling resolution of this palynomorph record and assessing the relative importance of climate, sea level, and local insolation as controls on the palynomorph assemblage off the West Coast of New Zealand. My supervisors for this research are Gavin Dunbar (ARC) and Mike Hannah (SGEES). *Matt Ryan*





Poles Apart: The Great Climate Change Debate

(Random House $39.95)

Gareth Morgan couldn't determine who was right on climate change issues from media reports and talking with friends, so he decided to sort it out himself. With writer John McCrystal he sought the views from both sides of the debate - established climate scientists reflecting the IPCC view, and skeptics who believed that present climate change was natural. The former included ARC's Peter Barrett, Lionel Carter, and ARC Adjunct Prof David Lowe, who became known as "Los Banditos". We think Gareth has done a great job on balance, although we don't agree with everything he says. See our view at: www.sciencemediacentre.co.nz/2009/05/19/

So what was Gareth's conclusion? Read the book to find out! *Peter Barrett*

OTHER ACTIVITIES

Jaap van der Meer (in front)

Recent Visitors

During December and January, Jaap van der Meer, Professor of Geology at Queen Mary, University of London spent some time in the ARC working with Peter Barrett (ARC) and completing a paper on erosion and deposition features produced by cold-based glaciers in the Allan Hills area of the Transantarctic Mountains with Cliff Atkins (SGEES). Jaap and Cliff also took the opportunity to carry out some field work, collecting samples from debris-avalanche deposits in the central North Island and fault shear zones in Wellington and the Wairarapa.

Dr Poul Christoffersen from the Scott Polar Research Institute, University of Cambridge, visited from January-February. Poul is a glaciologist and engineer, actively working on incorporating sediment dynamics into glacial models, and came to learn more about subglacial sedimentary environments documented in the ANDRILL drill cores. He also got to know our modelling group, and we hope to work more with him in the future.

Assoc Prof Terry Wilson from Ohio State University and long time Antarctic colleague and ANDRILL collaborator, spent the six weeks over March and early April as part of her New Zealand sabbatical in Wellington hosted by Victoria University and GNS Science. Terry was continuing her research on the tectonic history of the West Antarctic Rift system and the role of tectonics and landscape evolution on glacial history, with Stuart Henrys (GNS Science) and members of the ARC. Some old papers were put to bed, and new initiatives started!

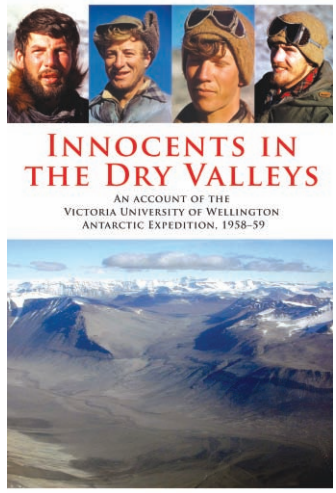
S.T. Lee Young Researcher Travel Award

Ana Aguilar-Islas

Ana Aguilar-Islas was this year's recipient of the S.T. Lee Young Researcher Travel Award, an exchange visit between the ARC and the International Arctic Research Center (IARC), University of Alaska Fairbanks. Ana's research at IARC has involved the study of sea ice-derived iron in the Bering Sea and its influence on the spring phytoplankton bloom. In the course of conducting this research, she became increasingly interested in other seasonal ice zones characterized by high macronutrients and low iron concentrations, such as Antarctic pack ice zones. The award gave Ana the chance to come to Wellington for a week in April and develop collaborative projects with Ken Ryan (School of Biological Sciences), Gavin Dunbar (ARC) and Cliff Atkins (SGEES).

Innocents in the Dry Valleys

(Victoria University Press $50.00)



COLIN BULL

This book records the beginnings of VUWAE and the first exploration of the McMurdo Dry Valleys a year later in the summer of 1958-59. The story is told in boisterous style by Colin Bull, physics lecturer and expedition leader of VUWAE 2, with slight moderating influence and contributions from his contubernial companions Barrie McKelvey and Peter Webb, 3rd year geology students, and biology lecturer Dick Barwick. The story behind the mounting of the expedition, and the resistance that was eventually overcome through the diplomatic skills of Bob Clark, to whom the book is dedicated, is also intriguing. Here's the inside story on how Antarctic earth science was planned and executed half a century ago! A great read and the royalties go to the ARC Development Fund.

Looking Back: Photo from the Archives

Photo by Trevor Hunt, VUWAE 17, 1972-1973

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