

IceSked

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Newsletter of the Antarctic Research Centre
Victoria University of Wellington

The links between Antarctica, the Southern Ocean and New Zealand are the theme of the third issue of IceSked. In order to understand past Antarctic climate, our researchers are looking at parallels in the environments of New Zealand and the subantarctic. By looking at New Zealand glaciers and subantarctic fauna, we are able to learn more about Antarctica, and vice versa.

Glacier-climate studies in New Zealand

Researchers in the Antarctic Research Centre have increasingly become involved in studies of New Zealand for three reasons.

Firstly, comparing present day glacier fluctuations, mass balance measurements and ice core records in Antarctica and New Zealand allows us to identify the local and regional drivers of climatic changes. This is particularly relevant for the late 20th century, a period of rapid global temperature increases.

Secondly, there was an extensive mountain glaciation that occurred in the Southern Alps during the last glacial cycle. This provides an analogue for the Ross Embayment during periods of 'cool temperate' glaciation identified in the Cape Roberts drill cores.

And thirdly, our significant polar experience is transferable to New Zealand alpine areas.



Ka Roimata O Hine Hukatere (The Franz Josef Glacier) from Castle Rocks Hut. The Franz Josef Glacier has been the focus of our study because it is a dynamic, sensitive glacier with fast response to climatic changes.

Andrew Mackintosh has been leading this New Zealand research. Earlier this year Dr Brian Anderson, who recently completed his PhD with Wendy Lawson at the University of Canterbury, joined him for a short research project. Brian's PhD research was on computer modelling of the recent fluctuations of the Franz Josef Glacier.

Andrew has recently secured a Victoria University Post-doctoral Fellowship that will fund a two-year position. The aim of the Post Doc is to create a simulation of the Southern Alps ice field through the last glacial cycle.

Dr Brian Anderson pointing out pieces of wood in a section at Canavans Knob near Franz Josef Glacier. The wood, radiocarbon dated at c. 13 000 years old, indicates that the overlying glacial sediments were deposited during the late glacial period, perhaps the Younger Dryas.



Royal Society Teaching Fellow

Julian Thomson has been a secondary science teacher for the last ten years at Raphael House Rudolf Steiner School in Lower Hutt. With a background in Geology and an enthusiasm for mountaineering, he has been involved with the instruction of students in climbing and alpine safety over a number of years.



Preparing for work on the Brewster Glacier in February 2004. From left to right, Oliver Korup (formerly SES, now Swiss Federal Institute for Snow and Avalanche Research), Andrew Mackintosh and Julian Thomson.

This has developed into collaboration with Uwe Morgenstern, physicist at GNS, and Andrew Mackintosh at the School of Earth Sciences (SES), using sixth form students from our school as glacier field assistants doing ice sampling and radar surveying work on the Tasman Glacier since 2001.

Thanks to support from the Royal Society Teacher Sabbatical Fellowship Scheme, Julian has spent 2004 at GNS and SES furthering his understanding of glaciers and the changing climate. As well as academic study this included practical participation in the field in the Southern Alps and in Switzerland (thanks to Margit Schwikowski at the Paul Scherer Institute).

This year started very positively with a trip to the Brewster Glacier near Haast Pass in February. This was led by Andrew Mackintosh and involved the placement of a series of 12 metre ablation stakes in the lower glacier as part of a mass balance measurement programme to be followed up over future years.

Other activities Julian has been involved in include mass balance measurements on the Franz Josef Glacier, drilling and measuring glacier ice on the Fiescherhorn and Monte Rosa, Switzerland, a visit to the Lamont Doherty Earth Institute in

New York, and Radar surveys on Ruapehu and on the Tasman Glacier. This last was in preparation for the deep drilling of the Tasman Glacier neve in October.

Julian is grateful for the “huge privilege” of being given this time out of school thanks to Royal Society funding. He would like to take this opportunity to thank staff at SES for hosting him so supportively.

Julian Thomson

Plant Opal in the Subantarctic

Vanessa Thorn has been investigating plant microfossils called ‘phytoliths’ from subantarctic Campbell Island, situated 600 km south of Bluff. What are ‘phytoliths’? They are microscopic particles of opaline silica produced by many plants, within and between their cells, in many different shapes. When the plant dies, the organic tissue rots away leaving the individual phytoliths in the underlying soil, possibly then transported into lake or sea floor sediments.

Phytoliths can be a useful tool for interpreting past climates by reconstructing vegetation from the geological record, especially where information from other sources like fossil spores and pollen is lacking. To do this we need to find comparable types in modern plants and extrapolate the modern climatic preferences of these analogues into the geological past. This methodology is referred to as “Nearest Modern Relative” analysis.

Why Campbell Island? The climate, although extremely oceanic, is similar to that interpreted for the south Victoria Land coast, and possibly other regions of the Antarctic coast, back in the Oligocene and early Miocene as the current ice sheet was stabilising. Mean summer temperature on Campbell Island is approximately 9°C. It is thought that the flora may have evolved similarly in both places to produce comparable phytolith assemblages.

An initial pilot study comparing selected modern plant and soil phytoliths from Campbell Island to phytolith assemblages extracted from the Cape Roberts cores off the Victoria Land coast highlighted differences in source vegetation phytolith production, with the modern Campbell Island vegetation producing dominantly grass phytoliths and the mid-Cenozoic Cape Roberts flora apparently containing mostly tree/shrub phytoliths.

In March this year, Vanessa participated in an expedition to Auckland and Campbell Islands organised by the Institute of Geological and Nuclear Sciences. Vanessa was funded by the Victoria University Research Fund and her Foundation for Research Science and Technology Post-doctoral Fellowship. An expanded collection of modern plants was made, vegetation surveys carried out and soil and peat collected. The plant samples will further knowledge about phytolith production in



Vanessa at Col Ridge on subantarctic Campbell Island, ~600 km south of New Zealand, during fieldwork in March 2004

the subantarctic and build on the pilot reference database. The surveys, soil and peat samples will help understand just how representative dispersed phytolith assemblages are of the overlying vegetation composition. This is important to clarify that “Nearest Modern Relative” analysis is a viable technique for phytolith analysis in the subantarctic.

Vanessa Thorn

New summer course on Climate Change

Dr Nancy Bertler has been involved in setting up an exciting new course called *Climate Change and New Zealand's Future* (ESCI 201). Designed for science and non-science students, the course provides a summary of current knowledge on climate change, its evidence and uncertainties, and climate prediction for the next 50 to 500 years. It discusses the influence of climate change on New Zealand's society, economy and environment, and governmental strategies for adaptation and mitigation. During a marae forum there will be time to discuss climate change from traditional and modern-day Maori perspectives.

The course is full-time and runs for three weeks from 18 January through to 4 February, and is open to anyone who has previous university experience. Lecturers on the course are experts from different parts of the University, and a range of science and policy agencies, including GNS, NIWA, the Climate Change Office, and Te Wananga o Raukawa.

Further details are available through our website www.geo.vuw.ac.nz/antarctic

Peter Barrett — Marsden Medallist for 2004

The award is by the NZ Association of Scientists for “a lifetime of outstanding service to science in New Zealand, in recognition of service rendered to the cause or profession of science in the widest connotation of the phrase”. See our website for more details.

O N T H E I C E

H042 — Cape Roberts Tide Gauge

Alex Pyne continues his maintenance and monitoring of the tide gauge he installed at Cape Roberts some years ago. The long record of tidal data collected by this instrument is useful for researchers in a variety of fields, and is maintained in conjunction with Land Information New Zealand (LINZ).

H047 - Ice in the Dry Valleys

Warren Dickinson is working in Beacon Valley for eight weeks this summer, looking at the issue of buried ice and permafrost. Andrew Mackintosh, Dan Zwartz, and third-year Geology student Leigh Hyland make up the rest of the party.

H049 — Ice Coring for Climate History

Nancy Bertler is drilling ice cores with a small team at two sites this summer. The first site is the Evans Piedmont Glacier, where they aim to take a 200 metre ice core. After a short restocking period at Scott Base, they will move to Erebus Saddle in mid-November, to take another 200 metre ice core. Both sites were surveyed with Ground Penetrating Radar (GPR) last season, and look suitable for collecting ice cores that should provide climate data over the last 10,000 years.

Nancy's team comprises Alex Pyne, Tony Kingan (Webster Drilling), Sepp Kipfstuhl (Alfred Wegener Institute, Germany) and students Mike Cavanagh and Daniel Bayliss. AWI has also loaned an Ice Drill for use on the project.

Endowment Fund Appeal Update

The Antarctic Research Centre combined with the Wellington Branch of the Antarctic Society to celebrate mid-winter on the 26th June. Following the screening of the film “Endurance” at Soundings Theatre, Te Papa, we launched our Endowed Development Fund appeal at the Brewery Bar and Restaurant.

We were privileged to have Dr Barrie McKelvey to officially launch the appeal. Along with Peter Webb, Barrie was one of the first Victoria University students to travel to Antarctica nearly 50 years ago, and we are fortunate that they have both agreed to act as the Patrons of the Appeal.

The generosity of alumni and friends means that the appeal has already raised more than \$125,000. The aim of the appeal is a capital sum of \$750,000 to provide an annual income of about \$30,000. The income will support student fieldwork in Antarctica, and contribute towards the development of new programmes.

As you will see elsewhere in the newsletter, three students are going to Antarctica with ARC programmes this year, and the Antarctic Research Centre has made budget provision to fund them at a basic level, while the Endowment Fund itself builds up.

Next year, we are looking forward to being able to use the income to make a significant contribution to the cost of student research. Once we reach the half way mark we will then look to supporting innovative research by other expeditioners where no other source of funding can be found. Although this may seem a slow way of making progress it does mean we have the certain knowledge that we have set up a long-term support system.

There are more details about the Endowed Development Fund appeal on the Antarctic Research Centre's website.

Jim Kennett — S.T. Lee Lecture

The Antarctic Research Centre was delighted to host Prof Jim Kennett, one of our alumni, to give the ST Lee Lecture in Antarctic Studies on 12 August, entitled *Antarctica's Contribution to Abrupt Global Warming Events – Past and Future*.

Professor Kennett, a graduate of Victoria University, is a world leader in earth systems science and is well-known for establishing the fields of marine geology and paleoceanography, the study of the oceans through time. Now the Professor of Oceanography at the University of California at Santa Barbara, Professor Kennett's recent research has highlighted the potential role of methane hydrates in abrupt climate change.

Prof Kennett also spent time talking with staff and students of the Antarctic Research Centre, and colleagues at the School of Earth Sciences, GNS and the Ministry for the Environment Climate Change Office. His busy schedule also included a lecture at the School of Earth Sciences on *Methane Hydrates in Quaternary Climate Change: Recent Developments and Tests*, and a field trip to Wanganui with Geology honours students.

The Antarctic Research Centre is grateful to Dr Lee for his support of the Lecture series, which has proved very valuable for the Centre and the research community.

Arctic — Antarctic Exchange

Daniel Pringle is the first Victoria University graduate student visitor to the International Arctic Research Centre (IARC) in Fairbanks, Alaska under a new endowment from Dr Lee Seng Tee.

Daniel's doctoral research programme was based on experimental determination of heat flow in sea ice and permafrosted soils, both of which relate strongly to work carried out in the IARC. His measurements have been carried out both in the Antarctic, in McMurdo Sound and on Table Mountain, and off the northern coast of Alaska at Barrow.

The sea ice study parallels one being undertaken by Hajo Eicken and his student Lars Backstrom at the University of Alaska, Fairbanks. There has already been a sharing of ideas, results and even field camps between the VUW and IARC groups. Daniel's visit will further the collaboration and also extend work toward an analysis of salinity profile data. This analysis is important for modelling the heat flow, as well as many related thermophysical parameters of sea ice.

During his time in Fairbanks, Daniel will spend time with the strong permafrost group at IARC, and discuss his own published determination of heat flow in the soils at Table Mountain.

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