

# **The 2002/2003 Antarctic Research Season**

## **THE CAPE ROBERTS PROJECT**

The CRP, also known as K001, is a major international geological science project, which is managed by *Antarctica New Zealand*. The Project has been based at Cape Roberts, which is 140 kms north of Scott Base on the continent, for the last five years. The aim of the Project was to drill for rock core beneath the sea floor to the east of Cape Roberts. The annual fast sea ice was used as the platform to support the drill rig.

There have been three successful drill seasons and last summer the CRP3 hole was drilled to a record depth for Antarctic rock core recovery – 940 metres below the sea floor. In each of the drill seasons some 80 people – scientists, drillers and support staff - were involved on the Project. The drilling phase of the Project is now over and the 'clean up' phase begins this coming summer.

In October-November 2000 a small *Antarctica New Zealand* team will attempt to traverse all the CRP equipment, currently stored on Cape Roberts, back to Scott Base over the annual sea ice. This is made up of over 40 sledge units with a total weight in excess of 300 tonnes. The task is expected to take five weeks. The Americans will assist with their heavy plant to haul some of the equipment part of the way.

In January 2001 another small party will deploy to Cape Roberts to carry out a final clean up of the Cape and restore it to its pre-Project condition.

### **Cape Roberts Project Personnel**

#### **Support Staff Oct-Nov 2000**

Jim Cowie	Cape Roberts Project Manager
Brian Howat	Engineer/ Plant Operator
Jim Shankie	Plant Operator
Scott Iremonger	Mechanic/Plant Operator
Brian Reid	Field Assistant/Electrician

## 2002/2003 RESEARCH SEASON

### EVENT SUMMARY AND CONTACT INFORMATION

#### **Molecular Identification of Planktonic Organisms from the Ross Sea**

Event           K018  
Dates: To be advised  
Location: To be advised

School of Biological Sciences, University of Auckland, Private Bag 92019, Auckland  
Dr Mary A. Sewell, Telephone: (09) 373 7599 extension 3758, Facsimile: (09) 373 7417  
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The pelagic community of the Ross Sea consists of a permanent component, exemplified by animals such as copepods, and a temporary component which is primarily made up from the larval stages of benthic marine invertebrates and fish. To date little attention has been paid to the distribution and abundance patterns of the temporary larval component, hampered in part by the inability to identify these larval "types" to the species level. The aim of this research is to use a combined morphological and molecular approach to identify to species the larval "types" collected in the Ross Sea. The common larval "types" of the coastal Ross Sea plankton community will be sorted from plankton samples taken in the vicinity of Scott Base, and preserved for return to the University of Auckland for morphological description (Light microscopy, SEM) and DNA sequencing. Using DNA sequences from adult Antarctic organisms, the larval "types" can then be identified to the species level. This is the first phase of a multi-year project designed to gain a better understanding of the biodiversity and seasonal patterns in the Ross Sea temporary plankton community.

#### **Mate Selection in the Adelie Penguin (*Pygoscelis adeliae*): male quality and female choice**

Event           K019  
Date:  
Location:

Ecology and Evolution Research Group, Level 2, Thomas Building, SBS, University of Auckland, PO Box 92019, Auckland  
Ms Emma Marks (PhD student), Telephone: (09) 373 7599 extension 7214, Facsimile: (09) 373 7414  
Email: e.marks@auckland.ac.nz

Mate recognition in extreme environmental conditions is crucial for breeding success. Antarctic penguins must communicate in the noisy environment of the colony, thus requiring a sophisticated vocal recognition system. This study investigates the importance of male Ecstatic display and the role of factors including nest location/size, and individual mating history in Adelie penguins (*Pygoscelis adeliae*) mate attraction and pair-bonding. The research is based on the following hypotheses: that male body condition will be reflected in the Ecstatic call (an honest signal); that seasonal change in body condition will be reflected in a change in male Ecstatic call; that colony condition will affect overall breeding success; that females are attracted to male Ecstatic calls and use them as a measure of fitness; that quality of nest location and nest size may also be used as measures of fitness; that male quality will be reflected in the breeding success; that females will compete for more males of "better" quality. This study furthers the research into female choice and competition in colonial birds, by investigating an example of honest signalling in a non-passerine species. If male condition can be assessed using the Ecstatic call, recordings taken at the beginning of the breeding season may be a non-invasive indicator of fitness within and between colonies. This has implications for the breeding season's likely success and hence stability of the population long term. Management protocols can then be applied to colonies that are exhibiting fluctuating male condition year to year to minimise disturbance to these colonies.

## **Evaluation of Deterioration Historic Huts and Terrestrial Biodiversity**

Event           K021

Date

Location

Department of Biological Sciences, University of Waikato, Private Bag 3105, Hamilton  
Professor Roberta L. Farrell, Phone: (07) 838 4704, Facsimile: (07) 838 4976  
Email: r.farrell@waikato.ac.nz

The historic huts and their contents on Ross Island and Cape Adare are a legacy of human exploration. The extreme polar environment has protected them from rapid decay but not from significant deterioration both biological and non-biological (wind abrasion and high salt concentrations). K021's principal goal is to identify cause(s) of the deterioration, determine the current condition of the deteriorated wood and obtain a better understanding of the unique degradation processes responsible for the deterioration. This basic information is essential if conservation plans for the long-term preservation of the buildings, and other artefacts, are to be successful. K021 is also determining terrestrial fungal biodiversity, including testing for, persistence, viability and mycotoxin production, particularly of the Specially Protected Areas and also wooden crates/packaging left behind at various sites in the Ross Dependency. In addition, K021 is interested from a global climate perspective in studying the Mt Fleming area for fungal biodiversity as this area is rich in pre-conifer fossils that show evidence of fungal decay.

## **Millennial-Scale Fluctuations of Dry Valleys Lakes: Implications for Regional Climate Variability and the Interhemispheric (A)synchrony of Climate Change**

Event           K022  
Date  
Location

Department of ????????, University of Waikato, PO Box 3109, Hamilton  
Dr Chris Hendy, Phone: (07) 838 4027, Facsimile: (07) 838 4219  
Email: c.hendy@waikato.ac.nz

Most researchers agree that Milankovitch (1941) seasonal forcing paces the ice ages but how these insolation changes are leveraged into global climate change remains unknown. If the timing and structure of the last termination are synchronous and symmetrical in both hemispheres, global forcing of the climate system is implied. Alternatively, if the timing of the last termination is asynchronous, then the mechanism for global climate change may relate to regional factors. The existence and relative phasing of climatic changes in both hemispheres must be determined in order to isolate mechanism(s) for global climate change. The Antarctic paleoclimate record is very sparse, and is largely limited to a few ice cores which give contradictory indications. The most persistent challenge to the hypothesis is asynchrony is the Taylor Dome Ice Core (Steig *et al.*, 1998, 2000). Revisions to the chronology have shown that the original interpretation of a rapid climate change synchronous with the initiation of deglaciation in Greenland probably was an artefact of the very low accumulation rates (Grootes *et al.*, in press; Mulvaney *et al.*, 2000). We propose to extend the paleoclimate record of the McMurdo Oasis by combining the present knowledge of enclosed drainage lake high strands, the isotopic and gas stratigraphy of the Taylor Dome Ice Core with evidence of enclosed and proglacial lake low stands.

## **Biodiversity and Performance of Lichens and Mosses**

Event           K024  
Date  
Location

Department of Biological Sciences, University of Waikato, PO Box 3105, Hamilton  
Prof T G Allan Green, Phone: (07) 838 4225, Facsimile: (07) 838 4324  
Email: greentga@waikato.ac.nz

This programme is designed to improve our knowledge of vegetation, lichens and mosses, diversity and performance in the Dry Valley region. A region of considerable importance because of the LTER (US Long Term Ecological Research site) and it's central position along the Ross Sea coast. Extensive surveys will be made of the vegetation in the lower Taylor Valley. In particular, the large moss area at the Canada Glacier will be analysed as a soil crust community. In addition to describing the communities present we will measure photosynthetic response of key moss species to environmental factors and the length of time they are active. Both factors are likely to be drivers for changes in biodiversity within the Ross Sea region. The photosynthesis of some lichen species will be measured under controlled conditions to add to existing knowledge of global trends in performance. Endolithic lichen communities will also be studied and sampled to see if fossil remains exist which will give us information about past changes in climate. The overall objective is sufficient knowledge about species and communities to allow us to interpret any changes in biodiversity that might be occurring.

## **Long-Term Impacts of Human Disturbance on Breeding Adelie Penguins**

Event           K027

Dates

Location

Department of Biological Sciences, University of Waikato, Private Bag 3104, Hamilton

Dr Joseph Waas, Telephone: (07) 838 4286, Facsimile: (04) 838 4324

Email: j.waas@waikato.ac.nz

Little is known of the long-term consequences of human disturbance on breeding Adelie penguins, despite sharp increases in recreational and research visits to the colonies. Sub-colonies of penguins at Cape Bird will be exposed to one of four experimental treatments, representing different levels of human disturbance (i.e. high, moderate, low and no disturbance), to measure effects on key long-term reproductive parameters (e.g. hatching success, fledging success, timing of breeding). Changes in reproductive and stress hormones will also be mapped to identify underlying mechanisms that might explain treatment differences. In stress and changes in reproductive state using enzyme immunoassays of faecal samples, by using the technique in conjunction with traditional blood sampling methods. Ultimately, our work will allow us to estimate the degree of human disturbance that is acceptable within colonies, and provide managers with new non-invasive tools (e.g. faecal sampling) to monitor the influences that human visits have on Adelie penguins.

## **Genetics of Antarctic Mosses**

Event           K028A

09 Jan to 27 Jan

Scott Base, Cape Crozier, Botany Bay, Marble Point

Department of Biological Sciences, University of Waikato, Private Bag 3105, Hamilton 2001

Dr Chrissen Gemmill, Telephone: (07) 838 4053, Facsimile: (04) 838 4023

Email: c.gemmill@waikato.ac.nz

This proposed research is one of several linked programs designed to deliver information about terrestrial bio-diversity along the entire latitudinal range of the Ross Dependency. Traditional taxonomic techniques are combined with the newer methods of molecular genetics to obtain an understanding of species and populations. Two molecular techniques: DNA sequencing and microsatellite markers, will be used to obtain information about the genetic structure of moss populations. These replace an earlier technique, RAPDs, which we have detected to produce high variability through fungal DNA contamination. A broad range of questions will be addressed, such as: 1) Are the current species based on traditional classifications supported by molecular analyses? 2) What are the relationships and origins of moss populations in Antarctica? 3) What are the biogeographic patterns for each of these moss species and are these patterns of dispersal congruent among different species?

## **Biodiversity of Terrestrial Invertebrates**

Event           K028B  
05 Jan to 27 Jan  
Scott Base, Cape Crozier, Botany Bay, Marble Point

Department of Biological Sciences, University of Waikato, Private Bag 3105, Hamilton 2001  
Dr Ian Hogg, Telephone: (07) 838 4225, Facsimile: (04) 838 4324  
Email: hogg@waikato.ac.nz

This programme will investigate the biodiversity of terrestrial invertebrates (particularly collembolids), along the entire latitudinal range of the Ross Dependency. It has linkages to related programmes studying the biodiversity of mosses, lichens and DNA in soils. Traditional, morphologically-based, taxonomic approaches for assessing biodiversity will be combined with more recent molecular techniques (e.g. allozyme and DNA analyses). Individuals from each study site will be evaluated using protein electrophoresis, mtDNA and morphological analyses. These analyses are designed to accurately assess existing levels of biodiversity and to provide information on the origin, evolutionary relationships and present day dispersal patterns of antarctic invertebrate taxa. This programme will improve our knowledge of the antarctic terrestrial fauna, develop New Zealand expertise in the area and provide information for the better management and conservation of antarctic terrestrial habitats.

## **Molecular Ecology of Antarctic Fauna**

Event           K030  
Date  
Locations

Department of Ecology, Massey University, Private Bag 11 222, Palmerston North  
Professor David Lambert, Telephone: (06) 350 5857, Facsimile: (06) 350 5866  
Email: D.M.Lambert@massey.ac.nz

A central prediction of the neutral theory of molecular evolution, is that the rate of evolution ( $k$ ) is equal to the rate of mutation ( $u$ ). A number of recent studies of human mitochondrial DNA have documented extremely high mutation rates that are significantly higher than evolutionary rates. This lack of concordance between empirical observations and theory has sparked a major controversy. We propose to use a unique biological phenomenon we have discovered in Antarctica, to advance our understanding of this central problem in molecular evolution. Underlying breeding colonies of Adelie penguins (*Pygoscelis adeliae*) are large numbers of serially preserved sub-fossil remains dating to 13,000 yrs BP. We have shown that, entombed in frozen penguin bones, is some of the best-preserved ancient DNA yet discovered. Adelie penguins offer a unique opportunity to both directly study molecular evolution, over a geological time scale, and to measure mutation rates in families of living birds. In preliminary research by this group, we have shown that it is possible, for the first time, to use a combination of modern and ancient samples to make precise estimates, of evolutionary rates. We aim to test the central predication of neutral theory by comparing evolutionary and mutation rates, using our unique discovery.

## **Hormonal and Behavioural Responses of Adelie Penguins to People and to Predators**

Event           K034  
Date  
Location

Institute of Veterinary, Animal and Biomedical Sciences, Massey University, Palmerston North  
Dr John F. Cockrem, Telephone: (06) 350 4483, Facsimile: (06) 350 5636  
Email: J.F.Cockrem@massey.ac.nz

It is generally thought that birds, like other wild animals, perceive people to be predators and hence potentially threatening. However, until our work at Cape Bird in 2001 there were no studies of how wild birds initiate stress responses when they are approached by people, and only one study of the stress response of birds to a natural predator. Corticosterone is the major adrenal steroid in birds, and plasma corticosterone concentrations show whether a bird perceives a stimulus to be a threat or not. Behavioural and corticosterone responses to people will be measured in Adelie penguins (*Pygoscelis adeliae*) to determine the duration of the responses, the effects of repeated exposure to people over several days, and whether the penguins are responding to a person or to a novel stimulus. The responses of penguins to south polar skuas (*Stercorarius maccormicki*) and to leopard seals (*Hydrurga leptonyx*) which are natural predators of penguins will also be measured. These studies will provide data relevant to determining appropriate distances for the approach of tourists to Adelie penguin colonies and will establish a new field of corticosterone research in birds.

## **Oceanography and Sedimentation Beneath the McMurdo/Ross Ice Shelf in Windless Bight.**

Event           K042  
Date: To be advised  
Location: To be advised

Antarctic Research Centre, VictoriaUniversity of Wellington, PO Box 600, Wellington  
Prof Peter Barrett, Telephone: (04) 463 5336, Facsimile: (04) 463 5186  
Email: peter.barrett@vuw.ac.nz

Ross Island has been depressing the crust under it's own weight for at least the last million years, and at the same time has been acting as the western pinning point for the McMurdo/Ross Ice Shelf (MRIS). As a result, fine-grained sediment has been accumulating in a sea floor depression 800+ m deep to the south of Ross Island in Windless Bight. These sediments record the presence and possible past absence of the MRIS, and the flow of Antarctic Bottom Water from beneath the ice shelf northward. We propose to survey the water column and sea floor sediment by deploying instruments through the 100-150m thick ice shelf at four localities between Hut Point Peninsular and White Island. The purpose is to characterise oceanographic conditions and depositional environment today and in the recent past. Measurements will include temperature, salinity, turbidity and current profiles. Cores will be taken to characterise the sea floor sediment and measure sedimentation rates over the Holocene. The results will provide a benchmark against which to compare possible future changes, and will provide a sound basis for interpreting core to be recovered as part of the ANDRILL project.

## **Cape Roberts Tide Gauge**

Event           K042A  
Date  
Location

Antarctic Research Centre, VictoriaUniversity of Wellington, PO Box 600, Wellington  
Mr. A.R. Pyne, Telephone: (04) 463 5396, Facsimile: (04) 463 5186  
Email: alex.pyne@vuw.ac.nz

The Cape Roberts Tide gauge was initially established in 1990 by VUW to support marine geological investigations and the Cape Roberts Project drilling operations in the last ten years. A permanent installation has been established and has continued operating since 1990 providing the longest tidal record for the Ross Sea region of Antarctica. The operation of the tide gauge has encouraged USGS and Ohio State University workers to establish Cape Roberts as a primary datum for their GPS stress and deformation control network in South Victoria Land. In 2000 LINZ in partnership with USGS have established a continuously recording GPS station at Cape Roberts that will also require continued tidal records. LINZ bathymetric survey commitments in the Ross Sea (C. Adare and C. Hallett) require a linked Ross Sea total datum and the Cape Roberts Tide gauge data recording was modified in 2000/2001 for this purpose. New drilling initiatives proposed in Granite Harbour will also require continued tidal data recording.

The Tide gauge installation will require refurbishment with increased data recording for a further 10 years of operation and to accommodate new users interests.

This proposal is to refurbish the tide gauge in 2002/2003 to enable its operation for a further 10 years. The operation will be serviced by VUW, supported by LINZ and data archived by LINZ.

### **Origin of Antarctic Permafrost: When were the Dry Valleys Last Wet?**

Event K047

Date

Location

School of Earth Sciences, Victoria University of Wellington, PO Box 600, Wellington  
Dr Warren Dickinson, Telephone (04) 463 6199, Facsimile: (04)463 5186  
Email: Warren.Dickinson@vuw.ac.nz

Liquid water is rare at high altitudes (>1000m) throughout the Dry Valleys, yet ground ice and it's associated polygonal ground are pervasive in glacial sediments and soils. The occurrence of this ice represents a major problem for understanding the landscapes and climate of the Dry Valleys because it no only occurs in sediments known to be millions of years old, but also in an environment thought to be free of running water for a similar period of time. The origin of this ice is different from it's Arctic and Alpine counterparts and may be similar to the origin of water on Mars. For preliminary data, including the observation of diagenetic minerals in the frozen sediments, we hypothesise that the ice accumulated over a long period of time from atmospheric water vapour and brine films formed on the surface of the ground. This hypothesis will be tested by analysing the chemistry of permafrost sampled from a transect of shallow (<10m) cores drilled on a variety of well documented surfaces in the Dry Valleys area.

### **Holocene Climate History from Coastal Ice**

Event K047B

20 Oct to 02 Jan

Lower Victoria Glacier, Wilson Piedmont Glacier, Baldwin Glacier

School of Earth Sciences, Victoria University of Wellington, PO Box 600, Wellington  
Ms Nancy Bertler, Telephone (04) 495 5233 extension 8391, Facsimile: (04) 495 5186  
Email: nancy.bertler@vuw.ac.nz

This study investigates the regional Holocene climate of the South Victoria Land coast, with special emphasis on the glacial history of the Wilson Piedmont Glacier (WPG) as a key indicator of the prevailing climate of the Dry

Valleys, and sea ice extent in the McMurdo Sound. To achieve this aim, ice cores will be analysed, which are the most detailed, continuous, and direct recorder of past climate change.

### **Paleozoic Terrane Correlation: New Zealand and Antarctica (continued)**

Event K051

Dates

Location

Department of Geological Sciences, University of Canterbury, Private Bag 4800, Christchurch  
Prof John D. Bradshaw, Telephone: (03) 366 7001 extension 7779, Facsimile: (03) 364 2769  
E-mail: j.bradshaw@geol.canterbury.ac.nz

The tectonics of the Cambrian-Ordovician Gondwana margin extending from Ellsworth Mountains to New Zealand and Australia are currently a 'hot topic' (e.g. Curtis, 2001) and recent advances hinge on field-work supported by robust geochronology. Both New Zealand and northern Victoria Land (NVL) lay on this active margin and show strong similarities and resolution of a major geological problems can be addressed by conjoint research in New Zealand and NVL. The Cambrian rocks of the Takaka terrane in New Zealand and the Bowers terrane in NVL include Middle Cambrian intra-oceanic volcanic arc rocks and Upper Cambrian conglomerates. Intra-oceanic arcs very rarely have granites but surprisingly the overlying conglomerates contain large granite boulders that suggest that intra-oceanic arc(s) collided with an active continental margin(s). Did that margin include the Wilson terrane, now adjacent to the Bowers terrane in NVL? When did collision happen? Does the same explanation apply in New Zealand?

Petrology and geochronology on material collected in 2000 shows that many of the granite boulders are of Middle Cambrian age and probably come from an Andean-type margin. We also discovered that a key conglomerate is stratigraphically unconstrained in a fault-bounded slice. It is vital that we visit our second target area where the age of the conglomerate is well constrained by fossils.

### **Natural Spatial Subsidies in Continental Antarctic Soil**

Event K052

Date:

Location:

Department of Plant & Microbial Sciences, University of Canterbury, Private Bag 4800, Christchurch  
Dr L.G. Greenfield, Telephone: (03) 364 2797, Facsimile: (03) 364 2083  
E-mail: l.greenfield2@botn.canterbury.ac.nz

Dry valley plant-soil systems are very stressed and rely on external resources (spatial subsidies). The effect(s) of such subsidies on these ecosystems is largely unexplored but may influence community and ecosystem level properties.

We plan to conduct an experiment at two sites in Antarctica – A stressed site (Garwood Valley) and an extreme site (Beacons) where resources may enter by aerial deposition. We will estimate and use resources of differing quality (bird droppings, microbial mats, surface foams and dust) and measure how the decomposer subsystem develops including community composition and diversity, microbial activity and key decomposer processes including decomposition and nitrogen release patterns.

### **Geophysical Response of Contaminants in Soil and Permafrost in the Vicinity of Scott Base**

Event           K054  
29 Nov to 11 Dec, 07 Feb to 16 Feb  
Scott Base

Department of Geological Sciences, University of Canterbury, Private Bag 4800, Christchurch  
Dr David Nobes, Telephone: (03) 364 2987 extension 7733, Facsimile: (03) 364 2769  
E-mail: d.nobes@geol.canterbury.ac.nz

Controlled spill and laboratory studies of contaminants in temperate climates have indicated that petroleum products and organic solvents are electrically resistive and highly reflective for radar energy. Recent field tests suggest that sites with older contaminant plumes are electrically conductive and absorb radar energy. The work proposed is to: 1) test the geophysical response of contaminants in a cold climate, specifically in the area immediately surrounding Scott Base; and 2) map the extent of contaminants, both laterally and with depth, in the soils and permafrost, again in the area immediately surrounding Scott Base. The results will initially be correlated closely to previous studies of, for example, oil contaminants near Scott Base, but the goal is to extend the work and to determine the vertical and horizontal extent of contamination using near-surface geophysical methods.

### **Dynamics and Ionisation in the Antarctic Middle Atmosphere**

Event           K055  
Date: To be advised  
Location: To be advised

Department of Physics and Astronomy, University of Canterbury, Private Bag 4800, Christchurch  
Dr Grahame Fraser, Telephone: (03) 364 2987 extension 7588, Facsimile: (03) 364 2469  
E-mail: g.fraser@phys.canterbury.ac.nz

The goal of the programme is to study the seasonal behaviour of this wave-driven circulation, particularly its dependence on major disturbances in the stratosphere which result in the transport of energy and momentum by waves to a higher altitudes.

The programme is based on continuous monitoring of winds in the middle atmosphere at altitudes of 60-100km using ground-based radar at Scott Base. The dynamical processes of this region are significant in controlling the circulation at lower altitudes, including the stratospheric ozone layer. The circulation is dominated by pole-to-pole flow, from the summer pole to the winter pole. This circulation is largely driven by atmospheric waves with time scales from 15 minutes to 15 days. The large scale of the phenomenon benefits considerably from co-operative observations by our own radar near Christchurch, and by our US colleagues at the South Pole, Admiral Heights (from January 2000) and Tekapo. We also use satellite data for the region between Antarctica and New Zealand.

Part of our programme is directly in support of Antarctic logistics, by providing ionospheric data used in forecasting HF communication propagation conditions.

### **Responses of Marine Organisms to Changing Environmental Conditions**

Event           K057  
Date: To be advised  
Location: To be advised

Department of Zoology and Gateway Antarctica, University of Canterbury, Private Bag 4800, Christchurch

Assoc Prof. Bill Davison, Telephone: (03) 364 2029, Facsimile: (03) 364 2024

Email: w.davison@zool.canterbury.ac.nz

Global warming has the potential to radically alter the composition of Antarctic marine ecosystems due to the extreme stenothermal nature of many of the organisms living in these cold waters. The proposed work will look at the ability of two groups of animals (fish and nemertean worms) to tolerate both acute and chronic elevation of temperature. Increased temperature is a stressor and the work will investigate changes to stress hormones and other indicators of stress such as plasma glucose, metabolism, anaerobic end products and plasma electrolytes. Associated work will examine aspects of X-cell gill disease on Antarctic fish, and the effects of pollution on both fish and worms.

### **Human Impacts and Microbial-Chemical ecology of Antarctic sponges.**

Event K059

Date: To be advised

Location: To be advised

University of Canterbury, PO Box 4800, Christchurch

Dr. N.S. Webster, Telephone: 364 4874, Facsimile: 364 2083

Email: n.webster@botn.canterbury.ac.nz

Increasing human pressure on Antarctica has highlighted the necessity for effective monitoring tools to assess the health of this fragile environment. Sponges are ideal indicator organisms for assessing marine benthic condition. This study intends to utilise the microbial symbionts of Antarctic sponges as highly sensitive indicators for the detection of sub-lethal stress caused by human impacts. Marine invertebrates host complex symbiotic microbial communities that significantly contribute to their host's survival. Furthermore, microbial symbionts are being identified as the source of many of the bioactive compounds previously attributed to sponges. This project explores the symbiont/metabolite link and it is envisaged that sponge metabolites may also be useful markers for the impact of environmental stress on symbiont populations. The key outputs of this research include a series of diagnostic test for measuring sub-lethal stress responses that can provide environmental managers with valuable predictive information, and a library of novel Antarctic microbial symbionts as well as invertebrate extracts for natural product screening programs.

### **Processes of Volcanic Vent Evolution: Coombs Hills**

Event K061

Date:

Location:

Department of Geology, University of Otago, PO Box 56, Dunedin

Dr. James D.L. White, Telephone: (03) 479 9009, Facsimile: (03) 479 7527

Email: j.white@otago.ac.nz

Volcanic eruptions arise from vents, and it is necessary to know the processes taking place in volcanic vents during eruptions if we are to understand how observed eruption phenomena are initiated. For continuous eruptions, the vent can for example be considered generally as a pipe. Many eruptions, however, involve discrete explosions and intermittent ejection of material. During such non-continuous eruptions, the vent structures are occupied by debris, and the effects of this in-vent debris, which may

be hundreds of metres deep, on eruption processes, is poorly understood globally. The Jurassic Mawson Formation at Coombs Hills comprises the deposits of a large and varied vent complex formed by explosive eruptions. The scale, variability, accessibility to study, high-quality, and extent of exposure of these volcanic vent deposits is unique, offering an exciting opportunity to address fundamental eruptive processes. Precise mapping of internal and external contacts of the vent complex, field, thin-section quantification of deposit componentry, and analysis of the vesicle and particle size and shape populations, will allow erection of a widely applicable model for the evolution of, and processes that shape an important class of volcanic vents and associated eruptions.

## **Magmatism in the TransAntarctic Mountains**

Event K062

13 Nov to 18 Dec

Mt Tricuni, Mt Harmsworth, C Teal, Bluntley Bluff, Cheney Bluff, Fontaine Bluff, Cooper Nun

Department of Geology, University of Otago, PO Box 56, Dunedin

Assoc Prof Alan Cooper, Telephone: (03) 479 7515, Facsimile: (03) 479 7527

Email: alan.cooper@stonebow.otago.ac.nz

Magmas generated during the early stages of the Neoproterozoic – lower Paleozoic Ross Orogeny have similar compositions and similar emplacement histories in both the Southern Royal Society Range and Skelton Glacier areas. These alkaline or ‘A’-type magmas have not been described from elsewhere in the TAM. In the Dry Valleys to the north, and the Central TAM to the south, Ross magmatism has the characteristic calc-alkaline signature of convergence and subduction along the paleo-Pacific margin of the East Antarctic craton. ‘A’-type magmas, however, require an extensional, or transtensional tectonic regime, despite their occurrence in a supposed convergent margin. This programme proposed to try to establish the scale of segmentation between convergent and extensional sections of the TAM by investigating the nature of magmatism immediately south of the Skelton Glacier. Comparison of the Ross Orogen of Southern Victoria Land with present day active margins around the world will enable a paleotectonic reconstruction of this segment of the Gondwana Margin and an assessment of its relevance to the evolution of the orogenic belt extension through New Zealand and Australia.

## **Basal Ice and Substrate Deformation at Subfreezing Temperatures**

Event K064

Date: To be advised

Location: To be advised

Department of Geography, University of Otago, P O Box 56, Dunedin

Dr Sean Fitzsimons, Telephone: (03) 479 8786, Facsimile: (03) 479 9037

Email: sjf@perth.otago.ac.nz

This proposal seeks support for an investigation of glaciological and geological processes that occur beneath glaciers that have basal ice temperatures significantly below freezing ( $<-10^{\circ}\text{C}$ ). The proposed research has three elements two of which involve excavating a 50m tunnel in the ice:

1. Making observations of the physical characteristics of landforms (moraines) and sediments at the ice margin;
2. Conducting experiments on the motion of the base of a glacier and its bed and;
3. Studying the physical and chemical composition of the base of a glacier.

### **Metabolic Consequences of Diving in the Weddell Seal**

Event K065

Date

Location

Department of Zoology, University of Otago, PO Box 56, Dunedin  
Dr Sheila J. Thornton, Telephone: (03) 479 5940, Facsimile: (03) 479 7584  
Email: sheila.thornton@stonebow.otago.ac.nz

Actively contracting muscle requires a continuous supply of oxygen. An exercising terrestrial animal increases heart rate and ventilation in order to match oxygen delivery to the oxygen requirements of the tissue. In contrast to terrestrial mammals, seals stop breathing, reduce heart rate and limit blood flow to the periphery during diving. Yet they are able to actively swim, forage, feed and travel underwater for extended periods, all the while isolated from the usual source of oxygen. How does a seal *increase* muscle activity while *decreasing* blood flow and oxygen delivery? The most plausible explanation is that a seal uses oxygen more efficiently during diving.

To achieve greater understanding of metabolic efficiency during diving, it is important to establish the degree of metabolic suppression (reduction of oxygen consumption) at the cellular level, and then investigate the mechanism by which it is regulated. This study aims to evaluate Weddell seal muscle cell efficiency under environments emulating diving conditions (low oxygen/high pressure).

### **Evolution and Adaptation in Notothenioid Fish**

Event K066

Date

Location

Department of Biochemistry, University of Otago, PO Box 56, Dunedin  
Dr Craig Marshall, Telephone: (03) 479 7570, Facsimile: (03) 479 7866  
Email: Craig.marshall@stonebow.otago.ac.nz

The development of the modern Antarctic ecosystem has resulted in the formation of a unique group of organisms in substantial isolation from the rest of the world. These organisms provide an ideal evolutionary laboratory for the study of molecular evolution and adaptation in a group of related creatures. We propose to try to determine some of the mechanisms by which a group of fish, unique to Antarctic waters have speciated. In particular, we are interested in correlating significant evolutionary changes in these fish to the increasingly better characterised climate record. There is some evidence that although many of the Antarctic fish appear very similar morphologically, cryptic species may be detected by our approach. Such cryptic species have some significance in understanding the ecology of the Southern Ocean. We also propose to use this group of fish to examine how low temperatures affect the physiology and biochemistry of organisms. In particular, we would like to extend our studies on the structural and functional relationships among proteins by examining protein folding in cold-adapted species.

### **Biology of Antarctic Springtails**

Event K067

Date

Location

Department of Zoology, University of Stellenbosch, Private Bax X1, Matieland 7602, South Africa  
Dr Brent J. Sinclair, Telephone: + 27 82 430 0567, Facsimile: +27 21 808 2405  
Email: bjs@sun.ac.za

In an era of climate change, the distribution of organisms and how this may change is of global importance. In particular, limits the geographic range of species is poorly understood. In Antarctica, the limits to species' geographic ranges are determined by strong temperature and moisture gradients in the physical environment. We will use the three species of springtails (Insecta: Collembola) that live in the terrestrial habitat of Cape Hallett in North Victoria Land to address key questions about global animal distribution. We will map the distribution of the three species of springtails at Cape Hallett, and relate this to moisture and temperature variables. We will also gather information on each species' responses to cold and drought to understand the way their biology limits their distribution. We will then integrate this ecological and physiological information with genetic data to test specific hypotheses about why there is an edge to a species' range. We will also conduct a general survey of the terrestrial invertebrate fauna at Cape Hallett, which will help us to understand the effects of climate change, and the efficacy of the SPA system at conserving terrestrial communities.

**Optical Properties of the Annual Sea Ice at McMurdo Sound: A test of the effects of Ultraviolet – B radiation on embryos and larvae of the sea urchin *Sterechinus neumayeri***

Event K068

Date

Location

Department of Marine Science, University of Otago, PO Box 56, Dunedin  
Dr. Miles Lamare, Telephone: (03) 479 7463, Facsimile (03) 479 8336  
Email: miles.lamare@stonebow.otago.ac.nz

We propose to quantify UV-radiation (UV-R) effects on planktonic invertebrate larvae in McMurdo Sound. During the *Ozone Hole* (Aug-Dec), McMurdo Sound is covered with approximately two metres of annual ice. Modelled increases in UV-R penetration through this ice are approximately 20 times greater than normal Spring doses, although no published measurements of UV-R under the annual ice exist. We will measure UV-R transmission through the sea ice and characterise the underwater light field of McMurdo Sound. We will also assess the effects of UV-R on the embryos and larvae of the echinoid *Sterechinus neumayeri*, both physiologically and ecologically. Concurrent measurements of the UV-R will be used to measure the dose of UV-B (290-320 nm) and amount of DNA damage these developmental stages experience at different depths. Using reared embryos and larvae, we will assess the effects of UV-R in laboratory and field experiments by quantifying larval mortality, delays in cell division, and DNA damage. These experiments will test whether UV-R absorbing compounds (mycosporine-like amino acids) provide protection from UV-R of effect the shape of the action spectrum for DNA damage in embryos and larvae exposed to UV-R.

**Monitoring Magnetosphere-Ionosphere Coupling and Space Weather at High Latitudes**

Event K069

Date

Location

School of Mathematical & Physical Sciences, Department of Physics, University of Newcastle, NSW 2308, Australia

Professor Brian J. Fraser, Telephone: (+61 2 49) 21 5445, Facsimile (+61 2 49) 21 6907  
Email: bhbjf@cc.newcastle.edu.au

This project will provide a better understanding of the dynamics and volatility of the near-Earth space, a plasma region populated by ionised gas embedded in the geomagnetic field. The dynamic behaviour of this plasma system, now referred to as “space weather” is of vital importance to the operation of modern technological systems, and its effects are most apparent at high latitudes, eg the aurora. Space weather can disrupt the operation of satellites, radio navigation and power distribution systems. The results of this study will provide important input parameters to global magnetospheric circulation models currently under development for space weather forecasting. In particular, it will study the dynamics and topology of the southern high latitude cusp, and polar cap, geomagnetic field regions open to direct solar influence. Ultra-low frequency (ULF) waves will be used as tracers in the study of high latitude plasma dynamics and magnetosphere-ionosphere coupling. Scott Base magnetometer and optical imager data, in conjunction with multi-point and multi-instrument observations from Australian manned bases and USA-UK polar cap automatic geophysical observatories (AGOs), will provide the basic data set for the study.

## **Cold Expectations: The Impact of Prior Perceptions on Mood in Antarctica**

Event           K073  
21 Aug to 19 Feb  
Scott Base

Human Sciences Division, PO Box 84, Lincoln University, Canterbury  
Dr Gary Steel, Telephone: (03) 325 2811 extension 8784, Facsimile: (03) 325 3857  
Email: steelg@lincoln.ac.nz

Research into the influence of expectations on emotions has had a long history in psychology, although a beginning has been made on empirical examination of the patterns and causes of moods in extreme polar environments, no published research exists on the expectation-emotion connection. Using a series of brief interviews, data will be collected regarding respondents' prior beliefs and expectations about the affective, social, and physical nature of Antarctica, and their subsequent, on-site perceptions of Antarctica. These interviews will be assessed for the degree to which there is discrepancy between expectations and perceptions. The level of discrepancy will then be compared to Profile of Mood States subfactor scores, which will be collected at the time of the interviews.

## **Hydrographic Cruise – R S Tangaroa**

Event           K080  
29 Jan to 17 March  
Balleny Island, Cape Adare, Cape Hallett, Possession Island

Joint NIWA/LINZ.

As part of the work NIWA will fit a SIMRAD EM300 multi beam system on to the R S Tangaroa.

## **Antarctic Aquatic Ecosystems**

Event           K081  
Date  
Location

NIWA, P O Box 8602, Christchurch  
Dr. Ian Hawes, Telephone: 348 8987, Facsimile: 348 5545  
E-mail: i.hawes@niwa.cri.nz

This programme seeks to provide fundamental information on the biology of Antarctica's aquatic ecosystems, focusing on two main areas; inland ponds and inshore marine areas. It deals with the climate-related environmental processes that influence the spatial structure of populations and community dynamics, and hence the potential for regional climate variability to impact on ecosystem structure and function. We use natural gradients in environmental conditions and productivity within the latitudinal range of the Ross Sea and address how the structure, diversity, trophic interactions and productivity of communities relate to site-specific physical variables. In the marine environment, we will determine the type and magnitude of primary production, patterns of resource utilisation by macrobenthos and the biodiversity of benthic communities over different spatial scales. Inland studies will compare structural and functional diversity of microbial mats and associated sediments at extreme high latitudes with studies at Bratina Island to investigate the role of increasing environmental stress.

We will test the potential of bacterial, cyanobacterial and algal activity and diversity as indicators of physical difference and investigate the possibility for the development of biotic stress indices.

### **Antarctic Aquatic Ecosystems**

Event           K081A  
06 Nov to 27 Jan  
Scott Base , Lake Hoare

Event           K081B  
16 Jan to 03 Feb  
Bratina Island

NIWA, P O Box 8602, Christchurch  
Dr Ian Hawes, Telephone: 348 8987, Facsimile: 348 5548  
E-mail: i.hawes@niwa.cri.nz

This programme will provide fundamental information on Antarctica's inland aquatic ecosystems in order to understand better how these sensitive systems respond to natural and anthropogenic change. Because of their dependence on melting of ice and snow these systems are particularly sensitive to climate change. What's more, being the foci of much inland biological activity and the low points of catchments, they are likely to be influenced by increasing human activity in the Ross Sea. The programme centres on the microbial mat communities that dominate many of these ecosystems, in terms of biomass and activity, and their underlying sediments. It examines how key processes, particularly light and temperature regimes and duration of freezing, influence mat composition, trophic structure and diversity by comparative studies of sites along latitudinal gradients in both North and South polar regions. It explores temporal variability by continuing a time series begun in 1989 at the McMurdo Ice Shelf. This bipolar, gradient approach examines the effects of changing environment on communities by use of spatial comparisons. The programme links with other national polar research programmes, including those of the USA, Spain and Canada.

### **Processes and Interactions in the Antarctic Atmosphere**

(This programme incorporates Events K085 and K087; separate PEE and Support Information Forms are included for each Event.)

Event           K085  
Date: Whole Year  
Location: Scott Base, Arrival Heights

NIWA, Private Bag 50061, Omakau, Central Otago  
Dr Brian J. Connor, Telephone: (03) 447 3411 Facsimile: (03) 447 3348  
Email: b.connor@niwa.cri.nz

The Antarctic atmosphere has a unique physical and chemical character which influences all latitudes. The goal of this programme is to improve our understanding of the Antarctic atmosphere's role in global change, its response to that change, and its impact on New Zealand. It focuses on three areas: the evolution of ozone depletion, the effect of that depletion beyond the Antarctic, and the Antarctic's influence on greenhouse gases. Springtime Antarctic ozone depletion is due to anthropogenic change of the stratosphere. Seasonal changes in circulation bring the depletion to mid-latitudes in summer, significantly decreasing ozone and increasing UV radiation in New Zealand. Although ozone-destroying chlorine has begun to decline, ozone recovery may be delayed 1-2 decades due to climate change. Testing model-based predictions with Antarctic observations will give early insight into ozone recovery. Changes in greenhouse gases, including ozone, affect the radiative balance of the atmosphere in ways that are not yet fully understood. The Antarctic provides a unique opportunity to determine global trends of trace gases at sites isolated from anthropogenic sources. Further, the uptake of CO<sub>2</sub> by the Southern Ocean can be quantified.

### **Atmospheric Air Sampling**

Event           K087  
24 Jan to 27 Jan  
Scott Base, Arrival Heights, NZ <-> Antarctica

NIWA, P O Box 14 901, Kilbirnie, Wellington  
Mr G Brailsford, Telephone: (04) 386 0393, Facsimile: (04) 386 2501  
Email: g.brailsford@niwa.cri.nz

As a major contribution to the balance of greenhouse gases, uptake of excess atmospheric CO<sub>2</sub> by the Southern Ocean is assumed in predictions of future climate change, but remains poorly quantified and understood. The Southern Ocean is expected to play a major role in CO<sub>2</sub> uptake for several reasons. CO<sub>2</sub> solubility is higher in colder waters, high wind speeds over the Southern Ocean drive rapid gas exchange across the air-sea interface, and deep ocean mixing in the high southern latitudes provides an efficient connection between the atmosphere and the very large carbon reservoir in the deep ocean. At present the most practical way of addressing the uncertainty in CO<sub>2</sub> uptake is to use precise measurements of atmospheric CO<sub>2</sub> in the Antarctic and high latitudes to infer surface fluxes and to complement this work where possible with in-situ measurements of relevant ocean chemistry and biology.

## **Climate Data Acquisition – Scott Base and Arrival Heights, Antarctica**

Event K089

Date:

Location: Scott Base, Arrival Heights

NIWA, PO Box 8602, Christchurch

Andrew Harper, Telephone: (03) 343 7890, Facsimile: (03) 343 7891

Email: a.harper@niwa.cri.nz

The goal of this programme is to obtain a high-quality continuous climate record for Scott Base and Arrival Heights in Antarctica, and archive it in NIWA's publicly accessible climate database. Scott Base is one of 47 reference climate stations for the New Zealand region managed by NIWA, and climate observations (wind speed and direction, air temperature, relative humidity, barometric pressure, global solar radiation, diffuse solar radiation and direct solar radiation) are recorded there daily. This climate record began in 1957 and is one of the longest continuous records in Antarctica. Wind speed and direction, air temperature, relative humidity and global solar radiation are now also recorded at Arrival Heights. The measurements are needed for characterising the local climate and state of the environment, identifying climate variations and changes, and in research on climate-sensitive processes and ecosystems. This programme now also includes the recently installed sea level recorder at Scott Base.

## **The Evolution of the Transantarctic Mountains and its Associated Rift System.**

Event K101

Date:

Location:

IGNS, P O Box 30368, Lower Hutt, Wellington

Dr Stephen Bannister, Telephone: (04) 570 4678, Facsimile: (04) 570 4600

Email: s.bannister@gns.cri.nz

The goal of the proposed research is to improve understanding of the structure and evolution of the Transantarctic Mountains (TAM) and associated offshore rift system in the McMurdo Sound region. Rifting of lithosphere is a fundamental process in the development of continents and their margins. The TAM trend for 4000 km across Antarctica, reach elevations of over 4 km, and form one of the world's major rift flank mountain chains. The range is apparently active but has low seismicity, there is a very large vertical offset across the rift margin (coastal western Ross Sea), and the deformation is apparently simple. The proposed work builds on existing onshore and offshore GNS research including the Cape Roberts project. The work has three main segments that will be used to constrain models of mountain range and rift basin development: (1) a terrestrial geological investigation focusing on the amount and timing of vertical and horizontal offset in the TAM of South Victoria Land commencing in 2002/03, (2) a major seismic investigation of the structure of the margin of 2003/04, and (3) a seismo-tectonic study of the present tectonic processes in 2004/05.

## **Seismological and Geomagnetic Observatories**

Event K102

03 Jan to 15 Jan

Cape Evans, Lake Vanda

IGNS, P O Box 1320, Kelburn, Wellington

Dr Fred Davey, Telephone: (04) 473 8208, Facsimile: (04) 471 0977

Email: fred.davey@gns.cri.nz

The seismological observatory records data on a continual basis from earthquakes occurring around the world. These data are analysed and transmitted to New Zealand and international agencies. The Scott Base – Dry Valleys seismograph system is one of the few in Antarctica and makes a significant contribution to New Zealand and global earthquake studies.

The magnetic observatory at Scott Base is an important site because of its long operation period. This observatory gives a record of long-term changes in the Earth's geomagnetic field. The observatory equipment at the Hatherton laboratory will be calibrated and checked this season. The Scott Base magnetic observatory is part of an international network monitoring the Earth's magnetic environment.

### **Geophysical Site Surveys for the Proposed ANDRILL Drillsite on Ross Ice Shelf, Black Island-Brown Peninsula Region.**

Event            K114

Date:

Location:

IGNS, PO Box 30368, Lower Hutt, Wellington

Dr Tim Naish, Telephone: (04) 570 4767, Facsimile: (04) 570 4603

Email: t.naish@gns.cri.nz

This research proposal seeks Antarctica New Zealand support for continuation of our geophysics acquisition programme aimed at providing survey data for positioning stratigraphic drill holes proposed by ANDRILL Consortium's, McMurdo Sound Portfolio of drilling (successful proposals 01-ANT-07 & 8 [Event K114] in 2001-2002 season). In last years proposal (01-ANT-07) we indicated that we would seek support in 2001-2003 for multi-channel seismic reflection, GPS, ground penetrating radar, and land-based gravity and magnetic surveys on the Ross Ice Shelf in the vicinity of Black Island-Brown Peninsula. This was following a successful reconnaissance of the region during the 2002-2002 season.

Specific information that will be provided by these surveys include: (1) water depth and geometry of sedimentary strata in the upper 2km of the Victoria Land Basin (seismic reflection); (2) ice shelf thickness (radar); (3) rates and direction of ice shelf movement (GPS); (4) subsurface extent of volcanoes and volcanoclastic sediments (magnetometer measurements); and (5) basin/basement geometry (gravity and magnetics).

## **Adelie Penguin Population Dynamics**

Event K122

Date:

Location:

Landcare Research, Private Bag 6, Nelson

Dr Peter Wilson, Telephone: (03) 548 1082, Facsimile: (03) 546 8590

Email: wilsonpr@landcare.cri.nz

Currently we are investigating the mechanisms that control population size and colony distribution of Adelie penguins (*Pygoscelis adeliae*). Thus far we have investigated: (1) the relative importance of resources that constrain colony growth – amount of nesting habitat vs access to food; (2) aspects of natural history affected by exploitive or interference competition among neighbouring colonies – breeding and foraging effort; (3) climatic factors, especially sea-ice extent and concentration; (4) behavioural mechanisms that influence colony growth as a function of initial size and location – emigration and immigration. Only now are we in a position to determine the demographic mechanism of colony growth (or decline), and related to this understanding the effects of climate change on Antarctic marine organisms. In collaboration with a US team, we propose to test the hypotheses: (1) demographic parameters do not differ among the colonies in the southern Ross Sea; (2) timing of breeding differs at the colonies depending on environmental factors; (3) the northern position of the wintering area is critical to overwinter survival.

## **Impacts of Human Activities on Antarctic Soils**

Event K123

Date:

Location:

Landcare Research New Zealand Ltd, Private Bag 3127, Hamilton

Dr Jackie Aislabie, Telephone: (07) 858 3713, Facsimile: (07) 858 4964,

Email: aislabiej@landcare.cri.nz

As a signatory to the International Antarctic Treaty, New Zealand plays a key role in developing environmental protection measures for Antarctica. This programme supports environmental management of ice-free areas of the Ross Sea region by providing information on soils, impacts of human activities and soil climate. Ice-free regions of Antarctica are the focus of increasing human activity and infrastructure and therefore are vulnerable to impacts. Consequences of human activities in these areas are potentially many, including local pollution from oil spills and landscape modification for construction and roading. So far little is known about the significance of these impacts, although it has been suggested that potential adverse effects of tourism and research may be negligible relative to the effects of global climate change. We are collecting above, and below-ground soil climate data at various locations within the Ross Sea region. At each site, detailed information on soil properties, including microbial composition, is being collected, and investigation of the impacts of fuel spills on Antarctic soils continues. A key benefit of this research will be the development of a robust spatial context for Antarctic environmental management and research.

## **Sea Ice and Southern Ocean Processes**

Event K131

Date:

Location:

Industrial Research Ltd, P O Box 31 310, Lower Hutt  
Dr T G Haskell, Telephone: (04) 569 0000, Facsimile: (04) 569 0754  
Email: t.haskell@irl.cri.nz

A consortium made up of three NZ Universities, international collaborators and IRL proposes a programme or research 'Sea Ice and Southern Ocean Processes' that is of direct relevance to southern hemisphere climate and the fisheries of interest to New Zealand. This is being achieved by research on two complementary and intersecting objectives:

- i. *Thermal properties and growth processes in sea ice*, which focuses on aspects of sea ice that determines how it controls the relationship between the ocean beneath and the atmosphere above.
- ii. *ocean wave / sea ice linkages relevant to climate*, where the aim is to discover how sea ice is changed by waves with particular notice taken of spatial variability and abrupt transitions;

Specific research techniques include the measurement and understanding of the physical properties of sea ice using conventional and novel techniques including: NMR; thermal conductivity; optical characterisation; electrical resistance and the measurement of modelling of wave propagation in heterogeneous media.

## **Antarctic Sea Ice, Algal Productivity and Global Climate Change**

Event K136

Date:

Location:

Industrial Research Ltd, P O Box 31 310, Lower Hutt  
Dr Ken Ryan, Telephone: (04) 569 0279, Facsimile: (04) 569 0132  
Email: k.ryan@irl.cri.nz

The dynamic pattern of annual sea ice formation and loss may shift south under global warming. The resulting reduction of sea ice cover could lead to a change in primary productivity from predominantly sea ice algae to benthic and phytoplankton production. Such a shift could alter the dynamics and interactions of the whole marine ecosystem. Yet surprisingly, the effect of global climate change on Antarctic coastal ecosystems has not previously been investigated. The coast of Victoria Land presents a gradient that spans some 6 degrees of latitude of annual sea ice. This coastline can provide a proxy to assess the effects of future changes in ice cover under a warmer climate. We propose to conduct a transect along the southern part of the Victoria Land coast in 2002 in collaboration with Dr Ian Hawes of NIWA. Together we will assess total productivity in the water column at a series of sites. In 2003, we will return to two selected sites, identified in the first year, for more detailed study using recently developed techniques to establish temporal data. Plans for future years include new sites further north along the latitudinal gradient.

## **Ships Representatives**

Event K201

03 Jan to 25 Jan

Scott Base, Ross Island, Northern Victoria Land Coast, Ross Sea, Subantarctic Islands

*Antarctica New Zealand*, Private Bag 4745, Christchurch  
Emma Waterhouse, Telephone: (03) 358 0200, Facsimile: (03) 358 0211  
Email: e.waterhouse@antarcticanz.govt.nz

Transport to and from Antarctica for New Zealand Government Representatives on tourist vessels operating in the Ross Sea Region.

**MFAT/Staff**

Event           K202  
19 Jan to 25 Jan  
Scott Base

*Antarctica New Zealand*, Private Bag 4745, Christchurch  
Emma Waterhouse, Telephone: (03) 358 0200, Facsimile: (03) 358 0211  
Email: e.waterhouse@antarcticanz.govt.nz

Familiarisation for staff from Antarctic Policy Unit of Ministry of Foreign Affairs & Trade.

### **Telecom Maintenance and Installation**

Event           K211  
28 Dec to 18 Jan  
Scott Base

ConnecTel Limited, PO Box 1473, Christchurch  
**Chris Robinson, Telephone: (03) 363 8733, Facsimile: (03) 365 3693**

Annual inspection, maintenance and installation of communications equipment at Scott Base.

### **Historic Sites Management**

Event           K282  
29 Dec to 27 Jan  
Hut Point, Cape Evans, Cape Royds

Antarctic Heritage Trust, Private Bag 4745, Christchurch  
Nigel Watson, Telephone: (03) 358 0200, Facsimile: (03) 358 0211  
Email: n.watson.ah@antarcticanz.govt.nz

Implementation of the Antarctic Heritage Trust's annual conservation and maintenance programme at Cape Royds, Cape Evans, and Hut Point. This includes maintenance on the structure of the huts, condition assessment and conservation treatments of artefacts, identifying items for a reserve collection and monitoring the interior environment of the huts.

### **Te Reo Television Limited**

Event           K293  
30 Oct to 10 Nov  
Hut Point, Cape Evans, Cape Royds

Te Reo Television Limited, 9 Acton Place, Avondale, Auckland 1007  
Ray Waru, Telephone: (09) 828 9093, Facsimile: (09) 828 9094

The purpose is to produce a series of two documentary films for broadcast in New Zealand on TV3 as part of "Inside New Zealand". The films will be called "Going to Extremes" and will focus on the summer activities of New Zealand scientists, visitors and support staff involved in New Zealand sponsored programmes on the Ice. The films will look at the work of *Antarctica New Zealand* and how the summer programme is put together and managed.

### **Army Engineers**

Event           K300  
08 Dec to 18 Jan

Julian Tangaere, *Antarctica New Zealand*

Various maintenance, minor alterations and construction tasks.

### **Operation White Safari**

Event           K302  
01 Dec to 14 Dec, 29 Jan to 12 Feb

Julian Tangaere, *Antarctica New Zealand*

New Zealand Defence Force assistance in maintenance and environmental tasks.

### **RNZAF Antarctic Field Training**

Event           K304  
20 Oct to 23 Oct, 27 Oct to 30 Oct, 12 Jan to 15 Jan

Julian Tangaere, *Antarctica New Zealand*

Antarctic field training for RNZAF C130 crews.

### **RNZN - Attachment to USCG Icebreaker**

Event           K305  
20 Dec to 02 Jan

Julian Tangaere, *Antarctica New Zealand*

Providing RNZN personnel with experience of US Coastguard icebreaker operations in the Antarctic.

### **Swedish Science Visit**

Event           K351  
08 Dec to 14 Dec  
Scott Base, Cape Bird

Dr Dean Peterson, *Antarctica New Zealand*

A familiarisation trip to Cape Bird to obtain information for future research on penguins in collaboration with Dr John Cockrem (Massey University).

## Malaysian Science Visit

Event           K352  
29 Jan to 19 Feb  
Scott Base, Ross Ice Shelf

Dr Dean Peterson, *Antarctica New Zealand*

This research project intends to study the role of gravity waves in the dynamics of the Antarctic boundary layer in the Ross Sea region. Gravity waves activities have been detected in the British Antarctic Survey STABLE I/II program associated with shear instabilities in the katabatic flow (Darby and Mobbs 1988). This study will investigate further the role of gravity waves taking into consideration phenomena such as wave refraction and wave-mean flow interactions. The first phase of the study will be the observation and detection of the gravity waves using an array of microbarographs and related flux measurements using sonic anemometers and two automatic weather stations.

## Polar Atmospheric Water Vapour/Ionospheric Sensing Using GPS

Event           K352A  
Date:  
Location:

University Kebangsaan Malaysia, 43600 UKM Bangi, Malaysia  
Assoc. Prof. Dr. Zainol Abidin Abdul Rashid, Telephone: +03-89296327, Facsimile: +03-89296146  
Email: zaar@vlsi.eng.ukm.my

GPS signals are delayed by water vapour, dry air, hydrometeors and other particulates. Phased delays induced in GPS signals by the ionosphere and neutral atmosphere can be measured with high precision simultaneously along a dozen or so GPS ray paths in the field of view. These delays can be converted into integrated water vapour (if surface pressure data or estimates are available) and total electron content (TEC), along each GPS moisture data will help advance

### Worker Visits

Event           K360  
11 Oct to 16 Feb

Julian Tangaere, *Antarctica New Zealand*

Short term visits for maintenance, construction or consultancy projects.

## Education

Event           K391A  
23 Oct to 30 Oct  
Scott Base

Natalie Cadenhead, *Antarctica New Zealand*, Telephone: (03) 358 0200, Facsimile: (03) 358 0211  
Email: n.cadenhead@antarcticnz.govt.nz

The visit of four educators is part of *Antarctica New Zealand's* Education Initiatives Programme. The group will be on a familiarisation visit ahead of two major exhibitions at Southland and Auckland Museums, and an update of existing exhibits at Canterbury Museum and the Visitor's Centre, International Antarctic Centre.

## **Education**

Event           K391B  
19 Jan to 25 Jan  
Scott Base

Natalie Cadenhead, *Antarctica New Zealand*, Telephone: (03) 358 0200, Facsimile: (03) 358 0211  
Email: n.cadenhead@antarcticanz.govt.nz

Four Burnside High School students, accompanied by the Senior History Tutor, will undertake a living history project at Scott Base. Their study will be focussed on the TAE Hut.

## **Distinguished Visitors**

Event           K392A  
January 2001  
Scott Base, McMurdo Sound

Vivienne Allan, *Antarctica New Zealand*, Telephone: (03) 358 0200, Facsimile: (03) 358 0211  
Email: v.allan@antarcticanz.govt.nz

Familiarisation visit for key stakeholders from the political sector.

## **Distinguished Visitors**

Event           K392B  
15 Nov to 18 Nov  
Scott Base, McMurdo Sound

Dr Dean Peterson, *Antarctica New Zealand*, Telephone: (03) 358 0200, Facsimile: (03) 358 0211  
Email: d.peterson@antarcticanz.govt.nz

Familiarisation visit for key stakeholders from the science sector.

## **Distinguished Visitors**

Event           K392C  
21 Nov to 24 Nov  
Scott Base, McMurdo Sound

Vivienne Allan, *Antarctica New Zealand*, Telephone: (03) 358 0200, Facsimile: (03) 358 0211  
Email: v.allan@antarcticanz.govt.nz

Familiarisation visit for key stakeholders from the political sector.

## **Media Programme**

Event           K393

01 Nov to 08 Nov  
Scott Base, McMurdo Sound

Vivienne Allan, *Antarctica New Zealand*, Telephone: (03) 358 0200, Facsimile: (03) 358 0211  
Email: v.allan@antarcticanz.govt.nz

Four journalists representing different media and reflecting different public audiences will be in the Antarctic as part of *Antarctica New Zealand's* Media Initiatives Programme. Feature articles, documentaries and in-depth interviews will be the outcome available to both the New Zealand and international public.

### **Artists to Antarctica Programme**

Event           K394A  
16 Oct to 08 Nov  
Scott Base, Dry Valleys

Vivienne Allan, *Antarctica New Zealand*, Telephone: (03) 358 0200, Facsimile: (03) 358 0211  
Email: v.allan@antarcticanz.govt.nz

Craig Potton will spend three weeks in the Dry Valleys photographing the location in preparation for the production of a new book on the subject. Craig will be in Antarctica under the auspices of the Artists to Antarctica Programme.

### **Artists to Antarctica Programme**

Event           K394B  
27 Nov to 05 Dec  
Scott Base and other locations in the Ross Sea Region.

Vivienne Allan, *Antarctica New Zealand*, Telephone: (03) 358 0200, Facsimile: (03) 358 0211  
Email: v.allan@antarcticanz.govt.nz

*Antarctica New Zealand's* two Antarctic Arts Fellows are dance choreographer Bronwyn Judge and ceramic artist Raewyn Atkinson. Bronwyn will create a solo work from her visit to Antarctica to be performed throughout New Zealand. Raewyn will work in clay and glaze to capture the physical and visual environment.

### **Certificate in Antarctic Studies**

Event           K396  
14 Dec to 28 Dec  
Scott Base

Gateway Antarctica, University of Canterbury, Private Bag 4800, Christchurch.  
Prof Bryan Storey, Telephone: (03) 364 2368, Facsimile: (03) 364 2197  
Email: b.storey@anta.canterbury.ac.nz

The Graduate Certificate in Antarctic Studies is designed to provide a multi-disciplinary educational programme for graduate students with an interest in Antarctica, and for people working in relevant professions and organisations who are able to make a significant contribution to their communities as a result of the programme. A 10-14 day field trip to Scott Base is included as part of the intensive twelve week course run by the University of Canterbury and includes field work relating to all aspects of the lecture/discussion component of the course. Development and teaching of the course has involved input from all New Zealand universities and *Antarctica New Zealand*.

## **Scholarship**

Event K397  
01 Dec to 27 Jan  
Scott Base, Cape Bird

Dr Dr Dean Peterson, *Antarctica New Zealand*, Telephone: (03) 358 0200, Facsimile: (03) 358 0211  
Email: d.peterson@antarcticanz.govt.nz

The project entitled: "Factors Influencing the Vocal Behaviour of Adelie Penguins at Cape Bird, Antarctica" will focus on the development and identification of familial similarities and regional dialects in Adelie Penguin vocalisations. Emma Marks (Kelly Tarlton's Antarctic Scholar) will be pursuing this project.

Rochelle Deans has been chosen as part of *Antarctica New Zealand's* Education Initiatives in Antarctica Programme to observe penguins in their natural setting. Rochelle is the bird curator at Kelly Tarlton's in Auckland.

## ***Antarctica New Zealand* Christchurch Staff Visits**

Event K400  
03 Oct to 16 Feb

Julian Tangaere, *Antarctica New Zealand*, Telephone: (03) 358 0200, Facsimile: (03) 358 0211  
Email: j.tangaere@antarcticanz.govt.nz

Operational visits by *Antarctica New Zealand's* Christchurch staff .

## **Scott Base Summer Support Staff**

Event K401  
03 Oct to 19 Feb

Julian Tangaere, *Antarctica New Zealand*, Telephone: (03) 358 0200, Facsimile: (03) 358 0211  
Email: j.tangaere@antarcticanz.govt.nz

Deployment of Scott Base summer support staff.

## **Scott Base Winter Support Staff**

Event K402  
Oct 2000 to Oct 2001

Julian Tangaere, *Antarctica New Zealand*, Telephone: (03) 358 0200, Facsimile: (03) 358 0211  
Email: j.tangaere@antarcticanz.govt.nz

Scott Base winter support staff.

## **Environmental Management and Monitoring Projects**

Event K407

23 Oct to 03 Nov

20 Dec to 28 Dec

19 Jan to 27 Jan

Scott Base, Cape Roberts, Dry Valleys, Cape Bird, Cape Hallett

Emma Waterhouse, *Antarctica New Zealand*, Telephone: (03) 358 0200, Facsimile: (03) 358 0211

Email: e.waterhouse@antarcticanz.govt.nz

Environmental review of *Antarctica New Zealand* operations and supported activities including monitoring for compliance with the Antarctica (Environmental Protection) Act and environmental audit of the Cape Roberts Project. Activities will also include implementation of *Antarctica New Zealand's* environmental monitoring programme focussed on Scott Base and major field sites.

## ***Antarctica New Zealand* Board of Directors Visit**

Event K408

26 Jan to 29 Jan

Gillian Wratt, *Antarctica New Zealand*, Telephone: (03) 358 0200, Facsimile: (03) 358 0211

Email: g.wratt@antarcticanz.govt.nz

Visit to Scott Base by the Board of Directors.

## **Helicopter Support**

Event K550

06 Nov to 27 Jan

Scott Base

Julian Tangaere, *Antarctica New Zealand*, Telephone: (03) 358 0200, Facsimile: (03) 358 0211

Email: j.tangaere@antarcticanz.govt.nz

Helicopter support for *Antarctica New Zealand* sponsored operations.

## **ANTARCTIC SCIENCE PROJECTS NOT CONDUCTING FIELD RESEARCH DURING THE 2000/2001 SEASON**

### **Stock Structure, Productivity and Sustainable Use of Toothfish**

National Institute of Water and Atmospheric Research (NIWA), PO Box 14901, Kilbirnie, Wellington

Dr Peter Smith, Telephone: (04) 388 7461, Fax: (04) 386 0300

Email: p.smith@niwa.cri.nz