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THE PUBLICATION OF THE NEW ZEALAND ANTARCTIC SOCIETY

ANTARCTIC

VOL 41, NO. 2, NOVEMBER 2023

CRYOSPHERE CRISIS

Is anyone listening?

Citizen Science on the *Heritage Adventurer*

Giant Submarine Landslides —could trigger tsunamis

Life on the Edge —Part 2

Step Glide Repeat —in the footsteps of Roald Amundsen

Scott Base—before the change

AND MORE. . .

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Adélie penguins on a melting iceberg. Credit: Anthony Powell

Notes

CELEBRATION OF 90TH ANNIVERSARY OF NZAS:

The first meeting of the New Zealand Antarctic Society took place at the Dominion Farmers Building in Wellington on 2 November 1933, initiated by Arthur Hunt. In attendance were Sir Douglas Mawson and Admiral Richard Byrd. The Wellington Branch has organised a dinner to celebrate the anniversary on Thurs 16 November 2023 at Wellesley Boutique Hotel.

NOVEMBER BOOK LAUNCH:

This month the book *Artists in Antarctica* edited by Patrick Shepherd is being launched at a function at Scorpio Books, Christchurch on 15 November. See inside for a review of this book.

ADDENDUM:

In Vol. 41 No 2 June issue, the obituary for Graeme Wilson did not mention that Bob Buckley is the last surviving member of the Hut restoration team. Buckley's story will be told in the June 2024 issue.

NEXT ISSUE:

The copy deadline is 24 April for the June 2024 issue. Please email editor with the topic in advance.

Contents

Crisis in the Cryosphere Is anyone listening?

WITH AVERAGE MONTHLY global temperature breaching 1.5^{0}C above pre-industrial levels for the first time in July and a large El Niño event underway in the Pacific, 2023 is virtually certain to be the hottest year on record[1]. The World Meteorological Organisation (WMO) predicts we are on track to exceed the Paris target within the next five years[2]. As a result of this warming, the cryosphere in all its forms—polar ice sheets, ice shelves, sea ice, mountain glaciers and frozen ground—is in a state of crisis.

The scientific evidence over the last few years is clear and the observed changes are dramatic. Of major concern is that the cryosphere contains four irreversible planetary tipping points likely triggered between 1.5^{0}C to 2^{0}C of global warming. Throughout 2023, the world's science institutions have raised the alarm, but is anyone listening?

The Scientific Committee on Antarctic Research released its decadal synopsis on the state of Antarctic climate change and ecosystems[3], which led the 45th Antarctic Treaty Consultative Meeting (ATCM) to dedicate a day to the climate crisis resulting in the 'Helsinki Declaration'[4]. The World Climate Research Programme (WCRP) has written the 'Kigali Declaration' from its open science conference in Rwanda. This summarises the latest climate science since the IPCC's 6th Assessment Report for submission to the United Nations COP28 meeting in Dubai as an urgent 'call to action'.

THE BIG PICTURE

Scientific evidence is clear that due to the current trajectory of human-derived greenhouse gas emissions, the polar regions will continue warming at rates of up to four times the global average because of positive feedbacks, such as those related to retreating sea-ice. This amplified polar warming is driving accelerated melting of the polar ice sheets, now the largest contributor to rising global sea-levels. The Southern Ocean has taken most of the heat from global warming (70%), where it will remain for centuries melting the marine margins of the Antarctic Ice Sheet. Enhanced CO_2 uptake by the polar oceans will continue to acidify the global ocean, with the potential for die-back of low latitude coral reefs. The cryosphere, including the high-mountain glacier regions (e.g. Hindu Kush Himalaya), hold 70% of the world's freshwater. The loss of snow and ice drives global sea-level rise—impacting up to 2 billion people living along the world's coastlines by the end of the century—even if the 1.5^{0}C Paris Agreement climate target is met.

Sea levels will not rise evenly. Ice mass loss and its redistribution in the oceans causes regional deviations up to +/-30% of the global mean sea-level rise. These deviations are due to changes in Earth's gravitational field, axial rotation and geoidal deformation. In addition, more localised changes in sea-surface height, due to ocean and atmospheric dynamics, may be as much as four times the global mean. This is now happening in the western equatorial Pacific where low-lying islands and some the world's largest coastal cities are vulnerable. The impacts and hazards related to global sea-level rise manifest locally and regional factors significantly increase risk. This local risk information is often lacking. For many countries, vertical land movements (land subsidence) due to groundwater extraction, reclaimed land compaction, or tectonics will exacerbate the rate of rise significantly. These and the coastal hazards—such as flooding, groundwater inundation, and erosion—reduce the time window for critical adaptation thresholds. This is an issue for New Zealand where 40% of our coastline is subsiding. Fortunately this risk information is now included in the Ministry for the Environment's coastal hazards guidance for local government[5].

Loss of two-thirds of the world's high mountain glaciers is now likely, impacting another two billion people dependent on these frozen water stores for drinking, power production, agriculture,

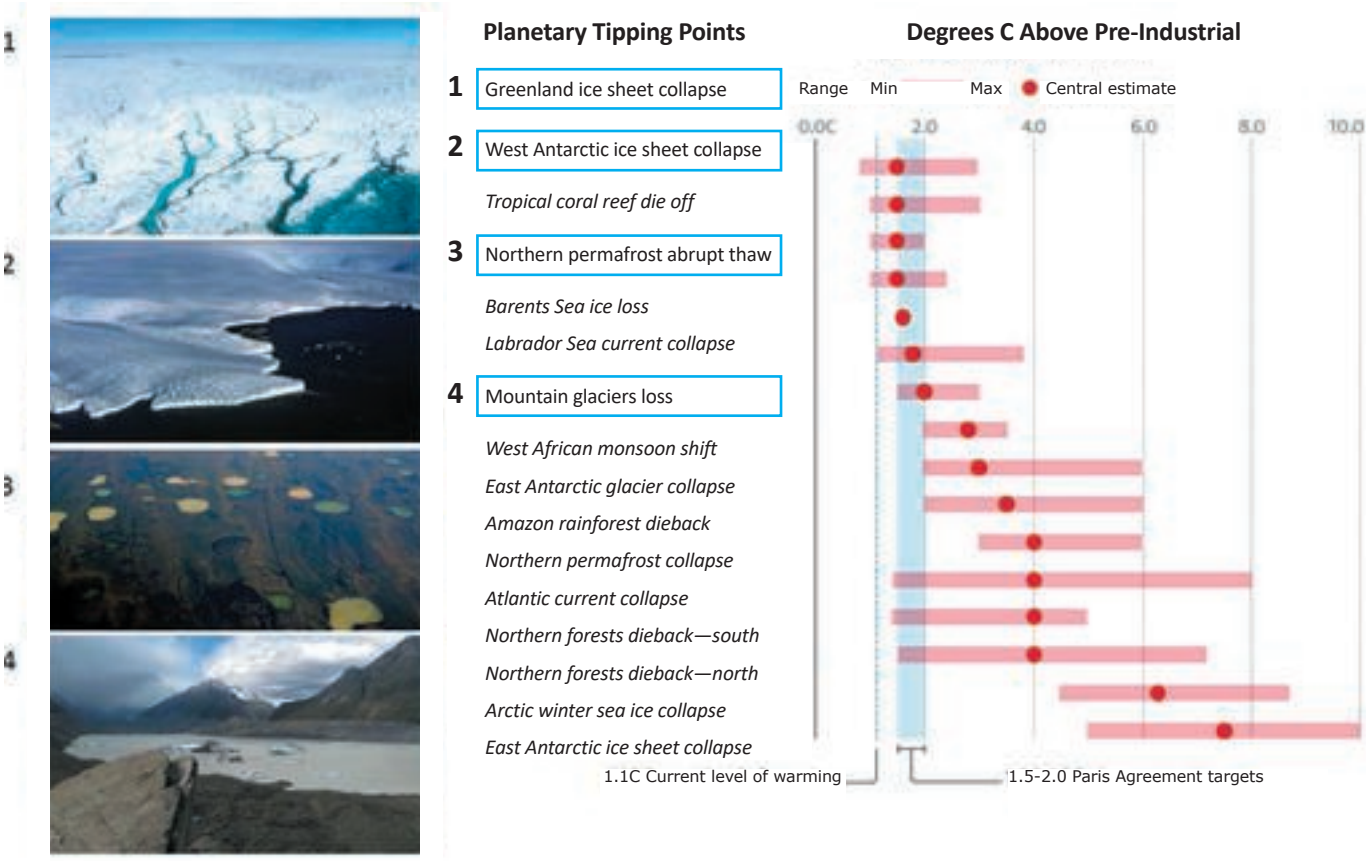

Figure 1. Planetary tipping points in the cryosphere associated with 1.5-2^{0}C of global warming above pre-industrial. Exceeding 1.5°C global warming could trigger multiple climate tipping points.

and the related ecosystems services, and through hazard related-risks from glacial outburst floods and landslides[6]. Thawing permafrost in the Arctic has the potential for regional and widespread release of methane and carbon dioxide from soils and sediments, into the atmosphere, further enhancing global heating. Four of these systems —the West Antarctic and Greenland ice sheets, mountain glaciers, and localized permafrost thaw in the Arctic—feature 'tipping points' linked to global temperature thresholds close to 1.5–2^{0}C above pre-industrial. Beyond this, change will be self-sustaining, locking in large multi-generational changes and impacts even if warming were to stop or reverse after peaking before 2100 (Fig. 1).

WHAT IS GOING ON?

Increased and continued ocean-driven basal melting and thinning of the marine ice margins of Antarctica, is decreasing the backstress from ice shelves which hold back the ice sheet leading to destabilization in the long term. How fast ice shelves break-up will determine when a significant acceleration in sea-level rise will occur. It is likely we are close to, or already passed, the tipping-point for parts of West Antarctica. Processes, such as self-sustaining marine ice cliff collapse and irreversible retreat of the grounded ice sheet into deep sub-glacial basins, could result in 1.6 m of global mean sea-level rise by the end of the century and 10 m by 2300, for a high emissions pathway[7].

Changes in the polar regions are being communicated to lower latitudes with dramatic consequences for climate, ecosystems and their services to society. Intense high-latitude, low-pressure systems—'bomb-cyclones', some in combination with mid-latitude blocking highs, are now bringing extreme temperatures and precipitation via atmospheric rivers to coastal and interior Antarctica and Greenland[8]. These extremes cause unseasonal weather not only in polar regions, but also in adjacent lower latitudes impacting ecosystems and human activities.

An unprecedented heat wave occurred over East Antarctica in March 2022, peaking at 39°C above climatological average—the largest temperature anomaly ever recorded globally[9] (Fig. 2). A local ice shelf, which was in a vulnerable state, collapsed within days.

Potentially, future heatwaves over the warmer, lower elevation West Antarctic Ice Sheet will trigger widespread surface melting and collapse of ice shelves[10].

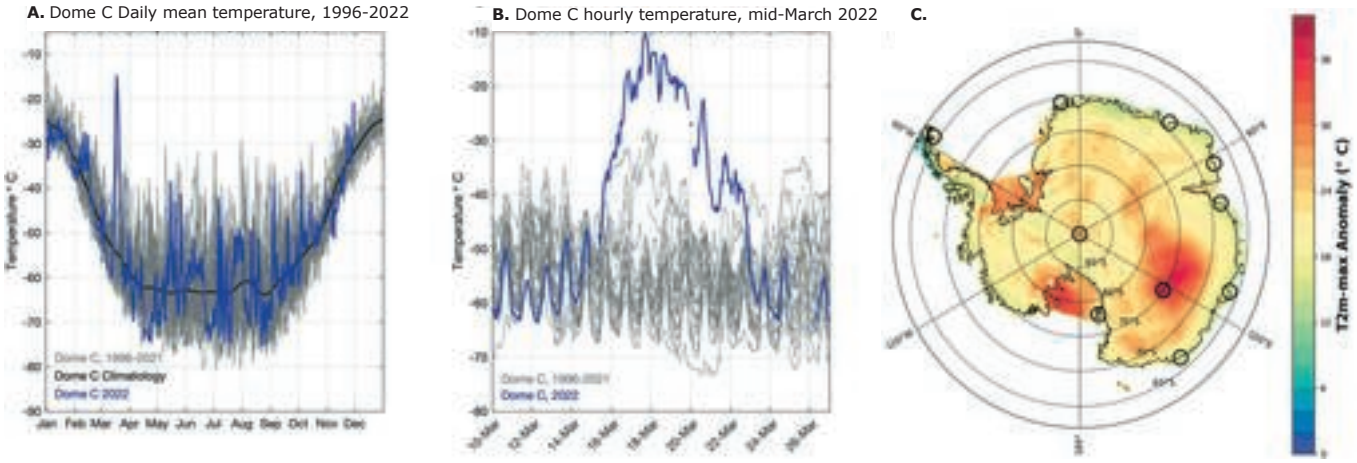

Figure 2. Heatwave associated with an atmospheric river from the tropics on 18 March 2022, recorded at Dome C, is the largest temperature difference from normal (anomaly) ever recorded anywhere on Earth[9]. It shows the huge extent of very large temperature anomalies over the East Antarctic, which are off the scale. A: Dome C daily temperatures over 1996–2021 (grey), 2022 (blue). B: Hourly temperature for mid-March, 2022. C: Surface temperature anomaly for mid March.

Winter Antarctic sea-ice extent reached a 40 year low in 2023, following the record low annual sea-ice minimum in early 2023 (Fig. 3), due to an unseasonably warm Southern Ocean plus changed atmospheric circulation patterns bringing warm air south[11]. These unprecedented changes were well outside the range of natural variability. They coincide with new evidence from a study of ice cores that shows the emergence of an amplified surface warming pattern over Antarctica attributed to humans[12]. Moreover, another single study suggests we are on the verge of a switch to a new reduced state in the sea-ice extent[13], which will enhance surface warming and ocean heat advection eroding ice shelves and hastening dynamic loss of the Antarctic ice sheet.

Associated freshening of the Southern Ocean is affecting ecosystem functions and loss. Direct measurements in the deep Southern Ocean suggest that a ~30% slowdown in the Antarctic overturning has occurred over the last few decades in both the Weddell and Ross Seas, linked to both meltwater and wind changes[14]. Model projections suggest this slowdown will

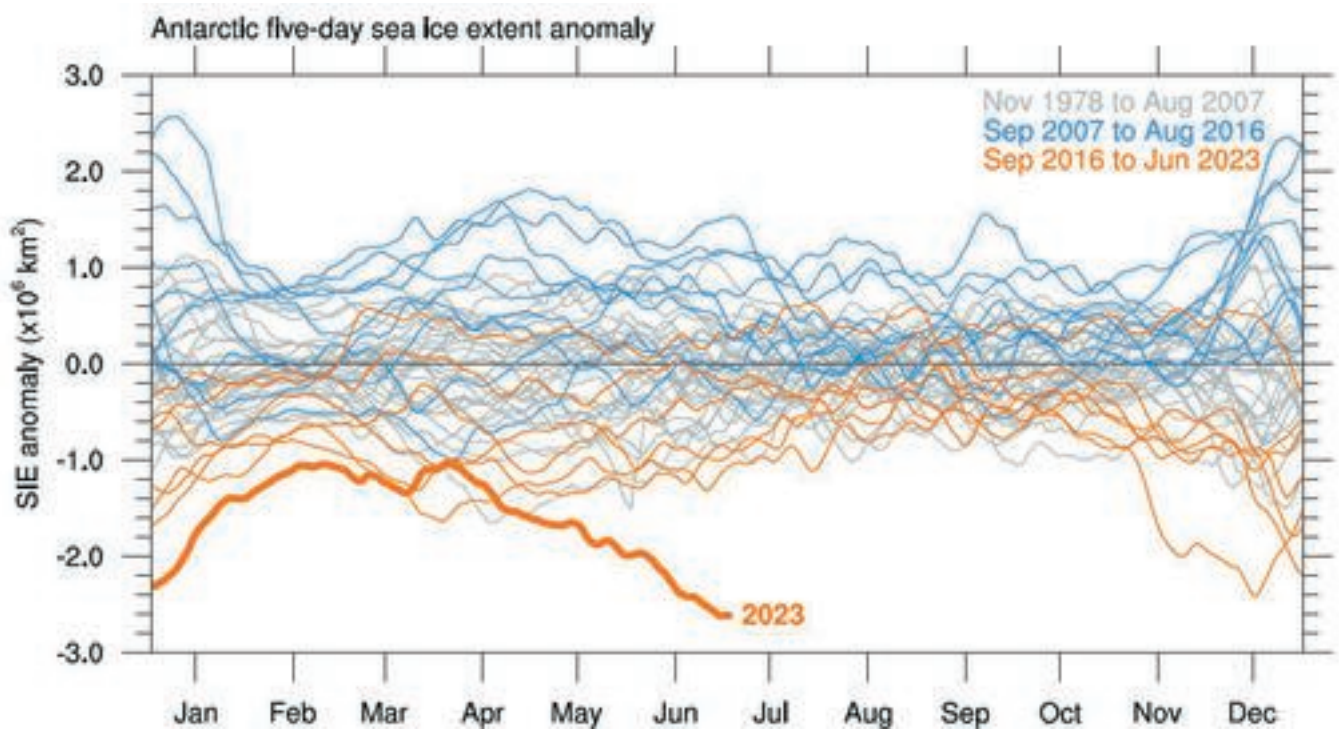

Figure 3. Antarctic five-day sea ice extent anomalies in millions of square kilometres for each year from 1978- 2023 from the National Snow and Ice Data Centre, showing reduced extent from the1978-2007 period to the 2016-23 period, with the extreme reduction in ice extent in the second quarter of 2023.

continue for at least the next few decades, with a collapse in the southern limb of ocean overturning circulation possible this century.

Amplified Arctic warming continues to reduce sea-ice extent dramatically. The Arctic is expected to be completely free of sea-ice at least once between 2030–2050[15]. Sea-ice loss also contributes to coastal erosion, ecosystem disruption, and a loss of services such as loss of traditional food sources and transport routes for indigenous peoples. On the other hand an ice-free Arctic Ocean opens up shipping routes and the potential for enhanced resource use. Arctic amplification has warmed the north west Pacific and is attributed to an increased frequency of marine heat waves[16].

Every year, high mountainous regions—such as the Andes, Alps, and Tibetan Plateau—store and release enormous amounts of freshwater into some of the most densely populated and productive agricultural regions on Earth. Not only will most of the glaciers be gone by 2100, but planetary warming is changing the timing and amount of this water supply causing extremes and enhancing the impact of droughts and floods. For example, glacial lakes in high mountain Asia have increased in volume by 45% since the 1990s, creating instability in these high frozen regions causing glacial lake outbursts and flooding. Such a flood in October 2023 destroyed infrastructure and had a death toll of at least ninety[17].

HOW SHOULD WE RESPOND?

Actionable science is critically needed to identify safe landing pathways for the cryosphere in order to minimise the risks associated with cryospheric loss, and enable effective anticipation of the hazards and flow-on impacts to ecosystems and society. Sustainable, equitable and just adaptation options can be implemented if they involve co-design, co-development and active engagement with decision-makers, practitioners and communities. Investment at pace and scale in technologies for observation, evaluation and numerical modelling is critically needed to support such endeavours.

The priorities listed opposite present future cryospheric research pathways identified within the WCRP. Some will be important for guiding the direction and impact of New Zealand's ongoing Antarctic research.

PRIORITIES FOR FUTURE CRYOSPHERIC RESEARCH

1. Improve understanding of the rates and (ir)reversibility of polar ice loss and their contribution to sea level rise, alongside adaptive decision tools and engagement with stakeholders. All this can help establish signposts for decision-makers to assist in more effective development and implementation of adaptation strategies. A special focus should be given to:

a. Understanding the delivery of heat to the Antarctic margin via ocean and atmospheric processes and how this will affect the timing of ice shelf loss and consequential rate of dynamic loss of the grounded ice sheet. This will include the identification of signposts and tipping points.

b. Understanding the key rate determining processes affecting the dynamic loss of Antarctic ice mass and their incorporation into models for projections. This increases confidence and reduces deep uncertainty in sea-level projections.

c. Improved knowledge of the processes of Greenland ice mass loss and its relationship to North Atlantic regional climate variations through better understanding of atmospheric circulation changes and their links with polar amplification over the Greenland region.

2. Improve understanding of the controlling processes of sea ice variability and retreat in the Arctic and Antarctic to improve predictability, including longer-term changes in sea-ice state. This allows better prediction of future heat and carbon budgets, and their consequences for the Earth System including impacts on ecosystems, human communities and cryospheric services.

3. Improve understanding of the rates and (ir)reversibility of snow and ice loss in high mountain regions, and the implications for water availability, food production, ecosystem services and related natural hazards.

4. Improve understanding of the processes of permafrost thawing in the Arctic and Antarctic for better predictability of spatial scale, rate and timing of irreversible methane and carbon dioxide release to the atmosphere and its influence on global warming.

THE BOTTOM LINE

The AR6 IPCC synthesis report[18] makes several urgent calls to action and provides some hope. It reinforces that "limiting warming well below 2°C involves rapid, deep and in most cases immediate greenhouse gas emissions reductions". By outlining "multiple feasible and effective, sustainable and equitable options to reduce greenhouse gas emissions and adapt to human caused climate change", it shows us that the future is still in our hands.

Notwithstanding this, it is now clearer than ever the policy world is not responding at the pace and scale required to avert the impending nexus of global climate, ecological and environmental catastrophes. Every nation is behind on its commitments to the UN Sustainable Development Goals—all of which require addressing climate change. Every nation's emissions policy settings are insufficient to achieve the Paris target. New Zealand is assessed as "highly insufficient". Norway is the only Global North country to be "almost sufficient". Ironically, the other nine "almost sufficient" nations are all from the Global South[19]. The point is, the policy response is grossly ineffective and has been that way since the first IPCC report in 1990.

This year, in complete exasperation, UN General Secretary, António Guterres couldn't have said it any clearer in his address to UN climate summit in Bonn, "**The era of global warming has ended; the era of global boiling has arrived. Leaders must lead. No more hesitancy. No more excuses. No more waiting for others to move first. There is simply no more time for that**."

By **Tim Naish**

ABOUT THE AUTHOR

Tim Naish attended Helsinki ATCM as WMO observer and Kigali WCRP Conference as Joint Scientific Committee member. He has contributed to the writing of both declarations and is co-ordinating a WCRP paper titled "Changes in Cryosphere and their Global Consequences" for publication in 2024. This article builds on his presentation in July to the New Zealand-Australia Antarctic Science Conference and summarises the latest science on the state of the cryosphere, why we should be concerned, and how we should respond.

Download a pdf of this article here:

https://antarcticsociety.org.nz/wp-content/uploads/2023/11/TN-Crisis-proof-Vol41-no2-2023-1.pdf

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SOURCES FOR FIGURES

Fig. 1: R. Levy modified from Guardian article on Armstrong-McKay et al. (2022)—Science. *Exceeding 1.5°C global warming could trigger multiple climate tipping points.*

Fig. 2: Blanchard-Wrigglesworth et al. (2023)—Geophysical Research Letters. *The Largest Ever Recorded Heatwave: Characteristics and Attribution of the Antarctic Heatwave of March 2022.*

Fig. 3: From the National Snow and Ice Data Centre.

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(3) https://scar.org/library/scar-publications/occasional-publications/5758-acce-decadal-synopsis/

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(17) https://eos.org/thelandslideblog/sikkim-glof-3

(18) https://www.ipcc.ch/report/sixth-assessment-report-cycle/

(19) https://climateactiontracker.org/climate-target-update-tracker-2022/

Rising global warming concerns coincide with a return to in-person science meetings

One Australasian and three SCAR* conferences took place this year, bringing together Antarctic researchers worldwide to discuss their latest findings, especially on the influence of global warming on the region and its consequences.

SCAR HUMANITIES AND SOCIAL SCIENCES (HASS) CONFERENCE

June 22-24, 2023. Lisbon, Portugal.
https://scarschass2023.ulusofona.pt/

THIS YEAR'S GOALS WERE: space for exchanging information on HASS research, to stimulate and organize research ideas, and to promote future collaboration. Over 100 scholars from all continents shared exciting new research ideas, with scholarship in the Antarctic humanities and social sciences now addressing a range of thorny social and legal issues. SCAR's Ant-ICON programme hosted a panel discussion exploring Antarctic conservation framing with questions on, for example, the place of humans and infrastructure in Antarctica. Natasha Gardiner reported on workshops and interviews investigating the Antarctic science-policy interface, with results now in press (PLOS ONE).

Daniela Liggett, University of Canterbury

NEW ZEALAND—AUSTRALIA ANTARCTIC SCIENCE CONFERENCE

July 25-28, 2023. Christchurch.
www.nzaasc.org

ANTARCTICA New Zealand and the Australian Antarctic Division brought together researchers from both countries for discussion and planning based on 130 oral and poster presentations. Seven conference themes ranged from science and technology to human connections and impacts on both the continent and the surrounding oceans, with Antarctic ice loss and its consequences at the fore. Speakers Neil Gilbert (NZ), Steven Chown, (Australia) and Ceisha Poirot (NZ) provided frameworks for addressing the huge policy, scientific and environmental challenges we face.

Peter Barrett, Victoria University of Wellington

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1

2

1. https://antarcticsociety.org.nz/wp-content/uploads/2023/11/SCAR-2023-report.pdf
2. https://antarcticsociety.org.nz/wp-content/uploads/2023/11/SCAR-AASC-2023-PB14Nov2023.pdf

XIII SCAR BIOLOGY SYMPOSIUM

July 31-August 4, 2023. Christchurch.
www.confer.co.nz/scarbiology2023

OVER 300 SCIENTISTS from 25 countries gathered Christchurch for 6 days of workshops and presentations, with 196 oral and 100 poster presentations and daily keynote addresses focusing on different Antarctic ecosystems and the impact of climate change. The Symposium delivered great science, and provided a rich cultural experience for all attendees. A keynote featured the perspective of Indigenous people on Antarctic science by Tā Tipene O'Regan (Ngāi Tahu), his appreciation for research by all Antarctic scientists, and insight into Mātauranga Māori, and Aotearoa New Zealand's unique relationship with Indigenous people. The "Christchurch Communique: Urging Immediate Climate Action", alerted the world to the unprecedented ecosystem changes happening in Antarctica reported at the Symposium.

Charles Lee, University of Waikato

SCAR INSTANT

September 11-16, 2023. Trieste, Italy.
www.instant2023.org

SCAR's INStabilities & Thresholds in ANTarctica (INSTANT) Scientific Research Programme aims to quantify the Antarctic ice sheet contribution to past and future sea-level change through better understanding atmosphere, ocean and solid Earth interactions and feedbacks. This can guide coastal management and adaptation planning as societies globally grapple with the sea level challenge. Around 300 INSTANT researchers gathered for the first time with the discussion focused on three topics: Atmosphere-Ocean-Antarctic Ice Sheet interactions, Solid Earth-Antarctic Ice Sheet interactions, Antarctic Ice Sheet contribution to sea-level projections.

New connections made at the conference will help us all as we strive to address the climate and sea level challenge.

Richard Levy, GNS Science

**SCAR – Scientific Committee on Antarctic Research*
www.scar.org

Obituary:

Bruce Alexander 1932–2023

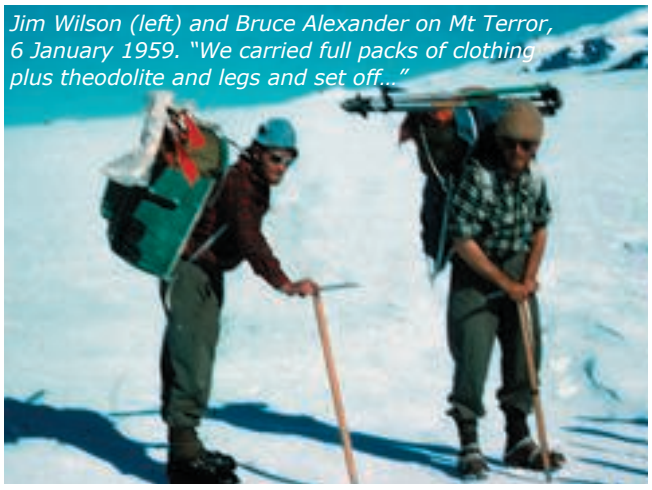
PIONEER ANTARCTIC SURVEYOR

Bruce Alexander, who died aged 91 in Christchurch on 3 August 2023, was a veteran of the New Zealand Geological and Survey Antarctic Expedition, 1958-59. He was leader of the party on the first ascent of Mt Terror (3,288 m) on Ross Island and was responsible for the first modern survey of the Mt Terror/Cape Crozier region.

The 12-person expedition sailed from New Zealand in USS Staten Island, on 25 November 1958. Bruce recorded: "I have never seen a ship roll as much as this one. Chairs and table coverings frequently go flying …." Their hopes of mapping large parts of North Victoria Land with a party based at Terra Nova Bay and another at Wood Bay were thwarted by ice conditions off Coulman Island. Instead, the Americans facilitated transfer, in Bruce's words, "to drop us off, unannounced, at Scott Base." They arrived on 15 December. Reception was "rather cool…we were classified as summer tourists by those who had wintered over, so instead of entering the Base, we pitched our tents nearby."

Bruce and his fellow surveyors assisted the Americans to make sense of aerial photographs taken since 1956, which had insufficient control points to be used for mapping purposes. He made several forays, by helicopter or fixed wing aircraft and took baseline measurements on the ground, of the Dry Valleys and the Victoria Land coastline.

Bruce, with mountaineer-assistants, Jim Wilson and Mike White travelled by sno-cat from Scott Base, to Cape Mackay late on 30 December. They man-hauled, at times with sails set, the remaining 25 kilometres to Cape Crozier, arriving on New Year's Day. In a 14-hour journey on 3 January they carried out a photo theodolite survey on a hill between two Adélie penguin rookeries, some 13 km from their Cape Crozier camp.



Jim Wilson (left) and Bruce Alexander on Mt Terror, 6 January 1959. "We carried full packs of clothing plus theodolite and legs and set off…"

Mike White

Mike White

Surveyor Bruce Alexander taking bearings by theodolite to prominent features, The Knoll, Cape Crozier, January 1959.

The trio set out for Mt Terror on 5 January with 35-kilogram packs. After almost eight hours, at 1450 m, they camped in what Wilson described as "a perfect camp site…with a beautiful little peak above it." On the second day they used crampons from 2,000 m. "The long plod across wind-ridged snowfields seemed never ending," Bruce wrote.

Altitude affected them from 3,000 m requiring frequent stops. Jim wrote, "The quick ascent from sea level meant any effort made us feel like vomiting." Near the summit Bruce described patches of "duck-egg-blue ice"—with crampons hardly biting—and a "damnable" ridge with unstable "loose pumice detritus." In 40 knot winds and temperatures of -10°F, Jim and Mike 'booked' for Bruce as he carried out a complete survey.

"We stood between Bruce and the wind to prevent him being blown away from his instrument," wrote Wilson. "We were glad when Bruce was finally satisfied, after about two hours, and we could stagger down to the sheltered place to thaw out. It was shortly after 9 pm."

They were back at the mid-way camp at 1.10 am on 7 January. The next day they scaled the peak above the camp (which they named the Mizzen Mast) "in time for a sun transit shot". A very cold wind meant "warm-ups in a sheltered ledge under the peak." Wilson added, "It was a precarious survey point all in all, but Bruce was unfazed. They breed them tough these surveyors."

They returned to their base camp at Cape Crozier early on 9 January. Before leaving for Scott Base by sno-cat six days later, Bruce succeeded in finding the remains of the stone igloo from the mid-winter journey in 1911, first located by Sir Edmund Hillary the previous year.

Late January, Bruce spent a frustrating week in a three-man party on Brown Island—now Brown Peninsula. A bright spot was a walk to its highest point at 816m to get to a survey station. He boarded HMNZS Endeavour on 5 February, and reached Wellington on 16 February before returning to Christchurch. A month later he was in Wellington "to commence work, plotting & tabulating results."

Post expedition, Bruce established a successful surveying practice with his friend, Pip Middleton. One of his high-profile assignments was the Mt Cavendish gondola. He became an expert in urban planning. He received a Civic Award in 1999, was a life member of the Mt Cheeseman Ski Club and of the Christchurch Civic Trust. In earlier years, he took a leading role in the Save Manapouri Campaign and was actively involved in hut building and search and rescue.

Bruce was a long-standing member of the NZ Antarctic Society. He retained an avid interest in Antarctic affairs throughout his life, keeping up with younger people with whom he eagerly talked at gatherings.

In his retirement he built a scale model of HMS Basilisk, on which a forebear, Francis Hayter had served, and also of HMS Bounty, because of its connection with Tonga. He and a fellow-surveyor had spent 18 months there in 1957-58 undertaking an official cadastral survey of the kingdom into small allotments. Their vehicle was one of only a handful in Tonga. Their Kodachrome photos give a unique insight into village life and Tongan society.

On 17 July 2023, Bill Nye, a specialist bookseller, hosted a function to honour Bruce, Jim and Mike, who were all in good form.

Only a year earlier, Bruce had launched his long-researched family history/ personal memoir, *For the love of Hayters*. Of note is Bruce's time as a nine-year-old living for ten months with family friends in Naseby, Central Otago. Bruce returned to Christchurch and attended Medbury School and Christs College. He became a keen skier and mountaineer. He tramped and climbed classic

Richard McElrea

Bruce Alexander (right) with fellow veteran Antarctic surveyor, Peter Otway, Christchurch, August 2021.

routes in the Canterbury/Westland mountains, those of northwest Otago, and at Aoraki Mt Cook.

In a 2021 testimonial, polar photographer and author, Colin Monteath QSM said Bruce's pioneering work producing an accurate map of the Mt Terror/Cape Crozier area was "an important first." Colin added that the help of Bruce and others to the Americans in interpreting aerial photographs in the Dry Valleys and along the Victoria Land coastline, "established benchmark mapping that laid the foundation for the scientific work in subsequent years."

Distinguished Antarctic surveyor, Peter Otway, MNZIS, PM, with respect to the Mt Terror survey, said, "Bruce has my absolute admiration for this exploit alone." Furthermore, Bruce's work with the US Navy "allowed the New Zealand surveyors to map large areas from the oblique aerial photography accurately located by their own surveys." Two years later he was following the same system—"and it worked well."

Bruce's tenacity and professionalism in carrying out the survey on the summit of Mt Terror was the pinnacle of his Antarctic achievements, as a surveyor from a pre-GPS era.

Bruce is survived by his wife, Ilena and two daughters, Jane and Margot. He is honoured in the name Alexander Hill (220 m), with a prominent seaward cliff face on the ice-free west slopes of Mt Bird, Ross Island (location: 77.275S 166 392E).

By **Richard McElrea** QSO

SOURCES: **By Bruce Alexander:** *For the Love of Hayters*, 2022; *One Hundred Fathoms Square*, 2013, co-author L. Wordsworth; Diary (and that of Jim Wilson) in *Return to the Antarctic, 2017*, by H.J. Harrington /E.B. Fitzgerald; *Reconnaissance Surveying in Antarctica*, November 1958; *Expedition diary* 1958-59; emails (various) to Richard McElrea. **Other:** *New Zealand and the Antarctic*, 1971, by L.B. Quartermain; *Antarctic* (2) 4-8; testimonials—Colin Monteath, Peter Otway; *New Zealand Gazetteer* gazetteer.linz.govt.nz. **Special thanks to:** Ilena Alexander, Jim Wilson and Mike White.

Citizen Science on the *Heritage Adventurer*

Heritage Adventurer

CITIZEN SCIENCE allows members of the public to participate in research projects in the field or a laboratory setting. In Antarctica, scientists working in cooperation with tour ships can easily involve passengers in their research, adding to their experiences beyond just visiting Antarctica. One such tour company operating in the Ross Sea, Heritage Expeditions based in New Zealand, has been an ideal platform for accessing numerous penguin colonies for scientific research.

Since 2001, I have been traveling to the Ross Sea to study one of the most abundant species of birds there, the Adélie Penguin (*Pygoscelis adeliae*).

My primary research focus has been the historical record of this species, which extends longer into the past in the Ross Sea than at any other region in Antarctica thanks to the excellent preservation of their tissues in the cold, dry environment. Here, penguin bones, feathers, and even mummified carcasses can be at least 45,000 years old, with some beyond the range of radiocarbon dating.

With this unique record, we can learn a great deal about how this species has responded to climate change in the past, especially during and after the last ice age and with other climatic events over the past 10,000 years. Can this record help us predict future responses by this species to current global warming?

Most of my expeditions to the Ross Sea have been funded by the National Science Foundation (NSF) with research grants through my university and with partner universities where my collaborators are based. NSF and the U.S. Antarctic Program, even with their extensive network of logistics and science projects in Antarctica, still cannot support travel to many remote field sites and penguin colonies. Thus, tour ships can help access areas that would otherwise be out of reach.

I first began conducting research from tour ships in the Antarctic Peninsula in the 1990s, providing lectures to passengers, and in exchange exploring and sampling new sites. This partnership was mutually beneficial as passengers were able to learn about and participate in an active research program, now known as 'citizen science'.

Mummified penguin from Cape Barne

Adélie Penguin Colony at Cape Adare, Ross Sea

Adélie Penguin carrying a nesting stone

When my research on penguins shifted to the Ross Sea, there were few or no tour ships operating there at that time. However, this has changed over the past decade and now several tour companies operate in this region.

In 2021, I contacted a New Zealand company, Heritage Expeditions, when I learned that they were taking passengers to the Ross Sea for 28-day cruises in January and February each year on their vessel, *Heritage Adventurer*. With the U.S. Antarctic Program still recovering from the Covid-19 pandemic and not fully operational, working again with a tour company to continue my research was ideal.

I was pleased to learn that the family-run Heritage group not only were willing to take me to the Ross Sea, but that they even encourage research from their ship on all their cruises. They also let me include a graduate student on the voyage to help collect samples and to assist with the day to day staff duties during the cruise. So in early January 2023, after an absence of three years I was finally able to return to the Ross Sea to continue my research and collect new samples, again with the help of the passengers as a citizen science initiative. We left Bluff, New Zealand, on 8 January with Aaron Russ, one of the company owners, as expedition leader along with an excellent staff of lecturers on Antarctic geology, history, and biology.

After visiting some of the sub-antarctic islands on the first few days of the cruise, we crossed the Antarctic Convergence and headed towards Cape Adare, a small peninsula at the entrance to the Ross Sea where we would make our first Antarctic landing. The tip of this peninsula has a low triangular beach called Ridley Beach that has both biological and historical importance. It currently (and in the past) is the location of the largest Adélie Penguin colony in Antarctica, estimated at over 338,000 breeding pairs. It also is the first place that humans overwintered on the Antarctic continent in 1899–1900 and the historic hut that Carsten Borchgrevink and his men lived in during this expedition is still present on this beach.

Historic hut at Ridley Beach

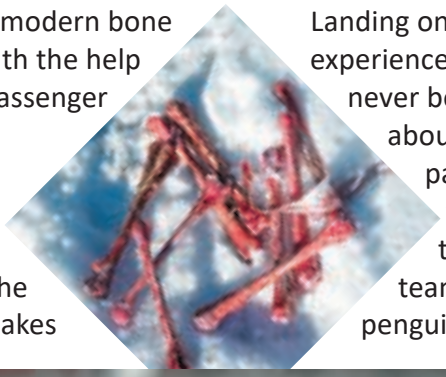
Cape Adare is not an easy place to visit as the beach is often surrounded by pack ice preventing zodiac landings, or there are strong winds and storms that preclude visits ashore. On this day, we were lucky as we had not only access to the beach through the pack ice, but also a calm sunny day. My research objectives were two-fold: to collect modern bone samples from Adélie chicks that had

Adélie Penguins with chicks at Cape Adare

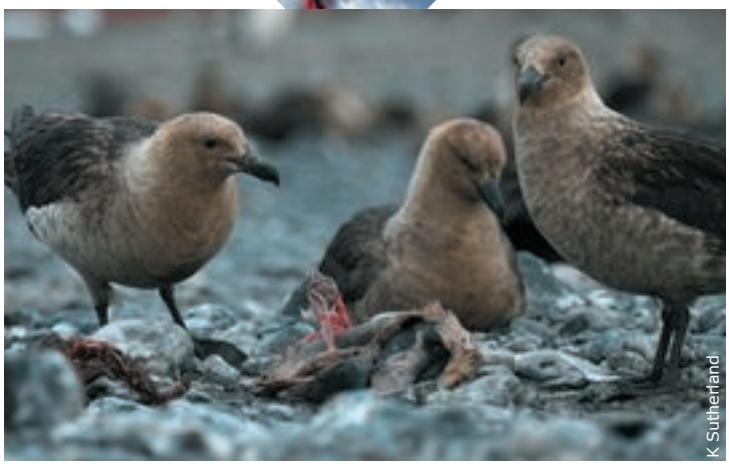
died at the colony that season, of which there were plenty thanks to the predatory South Polar Skuas also nesting on the beach; and to collect older deposits of penguin remains to determine through radiocarbon dating how long this colony has occupied Ridley Beach. In a previous visit to this site in 2005, my sampling indicated that the colony was approximately 2000 years old, but there may be older deposits at the back of the beach, where bones are eroding from layers of sediment 2–3 meters thick. The modern chick bones were collected for stable isotope analysis to provide information on foraging locations for this colony, by sampling what we could complete at each of the penguin colonies we visited on this voyage. After I showed my graduate student, Kate Sutherland, how to collect the modern bone samples from freshly dead chicks with the help of two passengers, I took another passenger with me towards the back cliffs.

To reach this area, we had to manoeuvre around thousands of penguins and their chicks, now formed in crèches so no longer on the nest sites. There were also shallow lakes between the ridges of ornithogenic soils, formed by penguins over centuries as guano, organic remains, and pebbles they used to rebuild their nests accumulated each year. These ridges, now above the water levels, allow the penguins to continue nesting on the low-lying beach. Unfortunately, with sea level rise, the beach will probably be underwater and abandoned over the next 40-50 years. At the cliffs there were indeed old penguin bones visible in the sediment layers and I was able to collect samples from two different levels. These could indicate older occupations of Cape Adare than I had dated previously.

Returning to the ship, we moved to the south and the next day were at Possession and Foyn Islands, both of which have active Adélie penguin colonies. I had not sampled these islands so it was a bit disappointing when the wind conditions precluded landing at Possession Island. However, the situation brightened because Foyn Island had a more sheltered landing spot and we would go there instead.



Landing on Foyn was an incredible experience—the penguin colony there had never been dated and little was known about its history. Kate and I plus four passenger volunteers moved quickly to sample as much as possible in the time available. Kate and her team began sampling for modern penguin chick bones while I scouted the active penguin mounds to find the largest and likely oldest ones there. I soon found two mounds worth sampling. I excavated small holes near the base of each and was able to find enough bone material near the bottom of the ornithogenic soils for radiocarbon dating that would give me



Skuas predate on penguin chicks providing plenty of bone samples

Adélie chick being fed, Foyn Island

Foyn Island

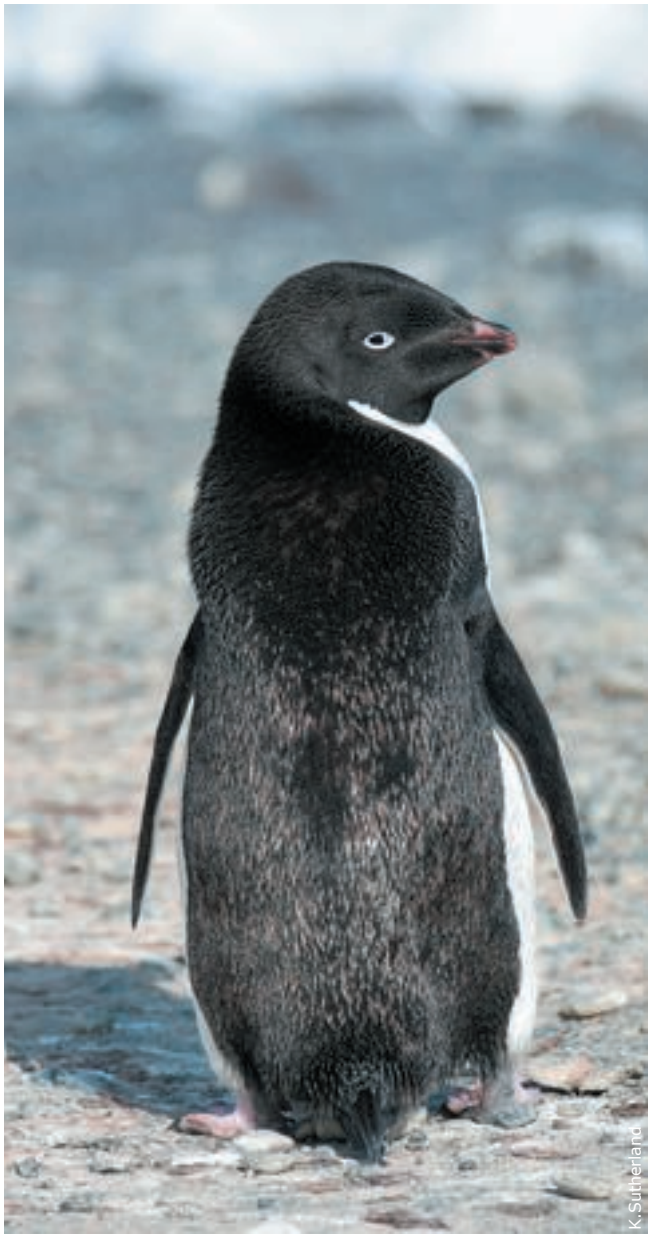
a good estimate for when this colony was first established.

We collected at several other penguin colonies before leaving the Ross Sea. We also collected marine phytoplankton samples from surface waters at 29 locations for background stable isotope data to help identify which foraging areas were being exploited by each of the penguin colonies.

Back in my lab, I immediately set to work on the samples, especially those for radiocarbon analysis. Samples from the back cliff at Cape Adare, dating from 600 to 1400 years old, proved to be within the same age range as the rest of the colony. The four samples from the two mounds at Foyn Island, though, provided the first radiocarbon dates for this colony. Three of the samples were very close in age and dated to about 1000 years old, but one dated to 4600 years old. So, this colony has been active for some time. Further sampling is needed to determine if it has been a continuous or sporadic occupation.

Overall, the research conducted with the help of the *Heritage Adventurer* led to new and significant findings that otherwise would not have been possible to retrieve. The passengers that assisted us were thrilled by the experience, and both Kate and I plan future trips to continue sampling in the Ross Sea with citizen science on the *Heritage Adventurer*.

By **Steven D. Emslie,** Department of Biology and Marine Biology, University of North Carolina, Wilmington, NC USA



Adult Adélie penguin

ACKNOWLEDGEMENTS

I thank the staff, crew, and passengers on the *Heritage Adventurer* on the Ross Sea trip in January 2023 for their enthusiastic support and help in collecting samples for this research project. Passenger volunteers included P. Alick, A. Ashford, M. Barnett, B. Bear, R. Bonte, E. Bourne, J. Brown, S. Dick, E. Gustavson, R. Johnson, E. Kiley, O. Michell, E. Musk, G. Rogers, S. Russ, F. Russ, A. Russ, and K. Tea. Kate Sutherland provided field assistance, editorial comments, and most of the photographs for this article.
This research is funded by NSF Grant OPP-2135695.

Life on the edge

Working at the crater of a slumbering giant—Part 2

The plume over Mt Erebus seen in November 1984

1. Ski tracks proving I had spent my aclimatisation productively

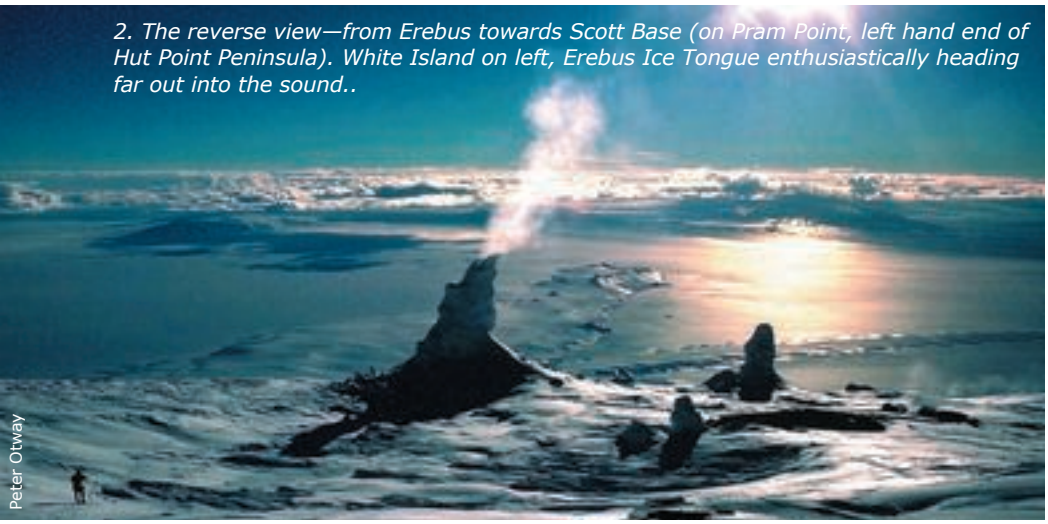
The first part of my story, published in the June Issue this year, told how the NZ Geological Survey's (NZGS's) new "Erebus volcanic deformation project" became part of the International Mount Erebus Seismic Studies project (IMESS). This annual programme has now been run by Kiwi-born Phil Kyle, a USARP geochemist and volcanologist, for a staggering 44 years without a break. When the deformation survey patterns were installed in the summit area in November and December 1980, IMESS was in its early stages. Phil had recently set up the Erebus Hut as the base, and NZ geophysicist Ray Dibble, assisted by American and Japanese colleagues, had commenced running a successful seismic programme. The NZ Lands and Survey Dept (L&S) also returned to continue survey observations for their Mt Erebus mapping project while various other programmes were just beginning.

The Erebus volcanic deformation project, of which I was the leader, involved annual precise surveys to detect any inflation or deflation of the 500 m-wide Main Crater as activity of the permanent lava lake waxed or waned. The process is described in Part 1. After 6 weeks, the survey was complete. However, there would be no results until the survey was repeated the following season, and hopefully at least 3 or 4 more times.

IN NOVEMBER 1981, I found myself back on that impressive volcano. We started with the obligatory short acclimatization period at the head of Fang Glacier. By a stroke of luck, thick fresh snow covered the sastrugi—and this time I had remembered to bring my skis to help my acclimatization! While everyone else dozed in their tents, I spent much of the first night carving tracks down a virgin slope beneath the Fang (1).

My ski holiday ended several days later when the helicopter picked up our international group for the short lift to camp beside Phil's "Mt Erebus Volcano Observatory" (later known as the Upper Erebus Hut). We camped 3,610 m above the Ross Sea and only 160 m below the rim of Main Crater, steaming rather menacingly above.

Over the next 5 weeks or so, we worked every day the passing storms and whiteouts allowed, just as we had done the previous year. They were a convivial bunch, as always—geologists, geophysicists, microbiologists, geochemists, seismologists, surveyors and mountaineers doubling as field assistants. Most of the group were fresh on the scene but with a few 'regulars' as well, such as Phil and his long-time working partner, Bill McIntosh, together with my tent-mate, Ray Dibble. Again, I was the sole observer for our volcano deformation survey, usually accompanied by an equally frozen field assistant to record the numbers I called out. The personal challenge of surveying around the active crater of Erebus in extreme conditions may have lost its novelty, but I was still very much aware of the privilege of working high on this unique volcano.



2. The reverse view—from Erebus towards Scott Base (on Pram Point, left hand end of Hut Point Peninsula). White Island on left, Erebus Ice Tongue enthusiastically heading far out into the sound..

3. Steve Currie booking while the author observes. Note our patent crepe bandage frostbite protection

4. The enormous 10m-long bomb too close to the Upper Erebus Hut for comfort.

The icing on the cake, after completing the last observations, was taking time out one evening to visit the magnificent fumarole towers on the gentle slope southwest of Side Crater, facing along Hut Point Peninsula—the reverse of the view I had become so familiar with during my time at Scott Base. The whole scene was truly amazing as we looked down past these steaming ice chimneys, along the peninsula, towards Mt Discovery with its head in the cloud, the endless Ross Ice Shelf to the left and frozen McMurdo Sound to the right with the narrow Erebus Ice Tongue enthusiastically heading far out into the sound. At the end of the peninsula was the unmistakable profile of Observation Hill, and to the left, the seemingly tiny buildings of Scott Base silhouetted against the ice gleaming in the low night time sun. A scene I will never forget (2).

The repeat surveys made over the following 4 years went ahead, fortunately very much as planned thanks mainly to the dedication of my colleagues, who, I felt, benefited from the whole Erebus experience in the same way I had. In 1982, my fellow surveyor Steve Currie from the Ministry of Works and Development (MWD) joined me (3). He was already experienced in using similar techniques for surveys of geothermal fields, and had used his programme to help compute my earlier surveys. He also brought with him an electronic distance measuring (EDM) instrument to strengthen the accuracy of the triangulation surveys. The following year, I declared myself redundant and stayed behind while Steve was joined by Brad Scott of NZGS, carrying out the third resurvey, again with no insurmountable problems. However, when Erebus began erupting in September 1984 with the biggest eruptions witnessed since Shackleton's day, I had no hesitation in rejoining the team which now included Brad and Graeme Blick, also of NZGS. Just the opportunity we had been hoping for to test the inflation theory on this truly unique volcano!

By the time we arrived, in mid-November 1984, the strombolian eruptions (ie mainly explosive rather than producing much fresh magma) were tapering off although the plume was still uncharacteristically menacing. Stark evidence was everywhere, with bombs of all sizes scattered around and beyond the hut, which miraculously remained untouched. Most sobering was the huge 10 m long bomb lying only about 200 m off to one side—big enough to have completely buried the hut and any hapless occupants, leaving no trace! (4) Fortunately, Phil Kyle had already arranged for a second hut to be airlifted and assembled 1.5km away downslope, where we congregated in safety and comfort to watch the occasional burst of bombs above the crater. He had also thoughtfully arranged for two skidoos, delivered by helicopter to the door for everyone's daily commute to the crater and elsewhere across the summit caldera!(5)

From our new home (the Lower Erebus Hut), we began occupying the 6 stations and the 2 tilt levelling patterns furthest from the crater, noting the generally decreasing frequency of the eruptions and range of the bombs. This location also gave us the opportunity to set up NZGS's new EDM ready for action, to make rapid distance measurements to reflectors temporarily installed on the flanks of the crater, as soon as we heard a loud boom. Sadly but not unexpectedly, we detected no movement of the crater during this short-lived experiment, but it was still worth a try! By the time the observations in this region were complete, we judged it safe enough to occupy the 8 stations on the rim of Main and Side Craters, and the remaining 2 tilt levelling patterns (6), all

5. Newly introduced skidoos in 1984

6. Precise surveying of a tilt levelling pattern

7. A fresh bomb of anothoclase crystals

of which were luckily still intact. Even so, there were a few frightening moments when a big boom shook the ground, followed by a shower of bombs mainly within the crater. All eyes would focus on the odd errant one beyond the rim appearing to stand still above—then there would be the quick sideways sprint. An increasingly loud whirring sound followed as it spun, then a thump nearby and a puff of steam, fortunately missing the theodolite and EDM—once again (7). The situation was even more intimidating in misty conditions or observing within the frustratingly persistent plume, by straining to spot any emerging bombs following a "boom" in time to take evasive action. Despite these distractions, we managed to complete the survey and return home almost in time for me to deliver my Christmas card (below).

The final survey was made in December 1985 by Graeme and Roger Williams also of NZGS. By this time the volcano had returned to its normal state, producing occasional small eruptions. We had clearly been lucky in striking such an active period during our experimental monitoring. It was the obvious time to terminate the programme and review the whole 5-year dataset, hopefully recording deformation of the crater rim in response to the 1984 eruptions. It soon became apparent that any inflation must have been too minor to produce detectable tilt at our tilt levelling patterns (exceeding 5 microradians—ie 5 ppm).

We struck more luck with the crater width measurements. The crater showed little change in the first year, but expanded (inflated) by approximately 20 mm during 1982, coinciding with a sharp increase in seismicity (but with no increased eruptive activity), followed by minor deflation the next year. The strombolian eruptions beginning in September 1984 provided the first real test, resulting in inflation of 50 mm across the crater during the previous 9 months, followed by a further 20 mm on a different alignment in 1985 as minor eruptions continued into the new year. In total, the crater expanded in a NW-SE direction by 60 mm (+/-15mm), mainly during the 1984 eruptions.

Interestingly, the axis of greatest expansion was perpendicular to the alignment of the geothermal activity linking Main and Side Craters with the Tower Ridge fumarole towers. This suggested that the increased heat flow into the lava lake causing the eruptions also extended into a shallow SW-trending rift feeding hot gas into the geothermal area. The minor nature of the inflation was in agreement with the seismic interpretation, confirming the conduit feeding the lava lake remained open during the whole period. It also provided further evidence for the absence of a substantial shallow magma chamber (such as under the active Hawaiian volcanoes) capable of producing a major lava eruption at short notice.

The Erebus volcanic deformation project was later included in the AGU's Antarctic Research Series as: *Volcanological and Environmental Studies of Mount Erebus, Antarctic*, edited by Philip R. Kyle. But, from a personal point of view, the memories are what will live on for those of us fortunate enough to have shared Phil's huts on the summit of Mt Erebus.

By **Peter Otway**

Step. Glide. Repeat

A story of an expedition to commemorate the 150th birthday of Roald Amundsen—a collaboration between New Zealand and Norway.

The author Laura Andrews

It's thirty below zero. The wind whips around your legs. Crystals caught in the turbulent flow swirl and eddy over the ice. There's a constant tug against your hips, the full sled a reminder of the isolation you and your team face. It's a cache of critical and life-preserving supplies; your tent, stove and food. You must drag the sled over and around every frigid obstacle.

Step. Glide. The repetitive motion that propels you forward, towards a horizon which never draws closer. Step. Glide. Over the hours and days and weeks, the team has fallen into a routine, pushing ever closer to the Pole. The midnight sun swings in slow circles overhead; it never dips, and it never rises. Step. Glide. Not a sign of life for weeks; just you and your team in the roiling polar weather. The rhythm of your lives. Wake, boil water, break camp. Step. Glide. For up to ten hours. Make camp, boil water, eat, sleep. Step. Glide. The world back home has faded into memory. Your every moment is honed to your one purpose here: reach the South Pole.

THE ABOVE description could be the mind's eye of any explorer from the Heroic Age of Polar Exploration, journeying across the vast continent, the bottom of the world—Amundsen, Scott, Shackleton, Mackintosh—seeking new horizons for humanity. But these are not the words of a hero of the 1900s. They belong to a small-town girl from Northland, Aotearoa, describing a time in January 2023. Over a century apart, but the same objective: to ski to the geographic South Pole.

For fifty days, our team of five traversed 920 km from the edge of the Ronne Ice Shelf to the South Pole. Our expedition members were from New Zealand and Norway. Each step we took was an echo of the footsteps of the famous Norwegian who won "the race to the Pole" in 1911.

The final team for the expedition had been announced in July 2022 giving just three-months to prepare for expedition departure. It was essential to engineer a good team dynamic. 350 applicants had been pared down to myself, Mike and Marthe. Together we brought a wide range of experiences from multisport and adventure racing, expedition kayaking and immense ski crossings. We were guided and taught by expert Norwegian guide Bengt Rotmo, who executed the first ski crossing of the North-West Passage in 2003. The expedition was led by Nigel Watson. Between Nigel's expansive knowledge of Antarctic history, Bengt's status as a modern polar trailblazer and our budding enthusiasm, this team tied together the past, present and future of polar exploration.

"Victory awaits him who has everything in order"

Roald Amunsden

PREPARATION for a journey is a process. For a remote expedition in one of the most hostile places on earth, it was essential we had everything in order. On opposite sides of the world, the team set into physical training, preparing their bodies for the long days on the ice by dragging car tires around back country roads and trails. We dove into historic and modern literature of polar explorers, trying to understand the human connection with this inhumane environment. Unlike the heroic explorers who spent months sailing to the South by ship, our team met up in Santiago, Chile, before flying to Punta Arenas to finalize preparations and training. For generations, explorers from the Northern Hemisphere have used cities such as Punta Arenas as a final stop before Antarctica,

In 2022 the Antarctic Heritage Trust ran the 9th Inspiring Explorers Expedition™, which is one of the ways in which the trust engages modern explorers with the legacy of the Heroic Age. In previous expeditions, explorers have crossed South Georgia Island, climbed Mount Scott in Antarctica, skied across Greenland, completed the Mahu whenua Traverse in the Southern Alps of Aotearoa, and sea kayaked around a section of the Antarctic Peninsula. The South Pole expedition was set to be the greatest expedition yet.

Step—Glide: crossing the vast frozen ocean of sastrugi

and it was humbling to see that heritage tangibly captured around every corner of the city. We realized that we were about to make our own mark in the annuls of polar history. We spent long days preparing: fifty days of pre-packed food, streamlining equipment, assessing safety plans and procedures and getting to know each other. One week turned into two as our departure was delayed due to conditions preventing the flight to Union Glacier. While it provided an opportunity to further reduce and fine tune our weighty supplies, it was a harsh reminder that we were under the heel of the great continent.

FROM THE MOMENT I stepped off the plane, as we handled our pulks out of the back door of the small skied twin otter, the experience was confronting. For over 5 hours we had flown over endless plains of ice, and yet it was just a fraction of the ice we were to cover. Ice. Everywhere. The air froze my nose hairs. A 360-degree view of nothing. As the plane disappeared over the horizon the silence was heavy. In this moment, the magnitude and isolation of our journey touched down.

Life on the ice was repetitive. Step. Glide. Our priority was survival first; then to make as much progress each day as we could. After a few smaller warm-up days, we skied for up to 10 hours a day, in legs of 60 minutes on and 10 minutes break. We were militant with our timing. We skied along in a single line; the person at the front navigating and breaking trail. The train could be lonely at times and the breaks were too busy to have a conversation. Sometimes we would listen to music or audiobooks, but more often we would lose ourselves in our thoughts and surroundings.

Our finely tuned sense of timing laid out the process of a break to the minute. A small delay, repeated over the course of ten sessions in a day, seventy sessions in a week, meant well over an hour of skiing progress lost. And I was the dedicated timekeeper. After 60 minutes of skiing, I would call time, sometimes screaming to overcome the katabatic winds. The line would curve into a neat semi-circle, and we would each commence the activities we needed to in that time. Eat, drink, toilet. All complicated by five layers of polar clothing. I would call a two-minute and then a one-minute warning, and then we would begin again: 60 minutes following the next team member in the cycle.

Setting up and breaking camp each day, we became a formula-one pit crew in action, everyone with a specific job. We would select a safe and flat campsite and erect our tents in alignment with the wind. It was a race to get our stoves going, melting ice and boiling water—a process that could take up to five hours a day. As the sun rotated overhead, one side of the tent would become like a sauna while the shadowed side felt like an ice box. In these moments, sheltered inside our red and yellow tunnels, we finally conversed, sharing our thoughts from the day skiing, dreams, memories, and the curious ideas that pulled us all together.

IEE_SP_Marthe Brendefur_386.

"Shining white, glowing blue, black crevices lit up by the sun; this land looks like a fairy tale"

Roald Amundsen

When most people imagine Antarctica, they see the carving ice cliffs, oceans teeming with sea life, plateaus clustered with penguin colonies and scientific research bases. It's easy to forget that is only the coastline of the vast continent. We began our journey at the edge of the Ronne Ice Shelf, 900 km away from the ocean. Although we were on top of the ocean, frozen as it was, we didn't see the classic face of Antarctica.

But we did see the heart of it. For over 900 km we watched vast, barren plains. You would be forgiven for assuming that our repetitiveness and routine and the ever-white vistas could be boring, but that would be missing the truth of it. Each day we were filled with awe and wonder at the harsh beauty of the environment. It was like a frozen ocean, because the wind had carved ice waves—'sastrugi'. There were days of calm and flat ice, and there were days like rough seas, sastrugi over a meter high. Occasionally the sastrugi were frozen in time, like a wave crashing, but glowing in the sun as it rotated above our heads and contrasting with deep purple shadows which flowed as the sun shifted its aspect. The weather systems which roll through the sky, envelop the team, and spit us out on the other side, a reminder of the power of the elements.

I was a rawer version of myself down there, stripped of the commitments of daily life. I was pushed in my mental and physical capacity, with heightened emotions and threats of cold injury. Roald Amundsen's diaries sing a similar song, even a century apart. Now discovered and cartographically complete, the magnitude of the place still enamoured us. We couldn't help but be invested, to want to protect this unique place.

The nature of modern polar expeditions is that the great "first" titles have all been claimed. Each of us walks in the footsteps of those who came before us, benefiting from their curiosity, their map-making, their innovations and lessons from their successes and failures. Ours was one of 18 expeditions on the ice in the 2023 summer. Each expedition formed a personal pursuit, a physical and mental challenge, a journey in a remote part of the world. Some of the expeditions were solo, while others were teams. There were speed record attempts and national firsts. Each expedition was its own story, but they are united in their urgency, because the ice is receding.

Antarctica is a phenomenal place, but it's not accessible for everyone. The legacy lives on through stories of the adventurers, the explorers, and the researchers who go down there. Our own expedition blog reached over one million people, and flowed into outreach once we returned, using social media, public speaking events and the production of a documentary. Each one of us, through our own version of storytelling, has brought Antarctica to the world.

Each day as we skied, I would turn around and look at the whakatauki* I had written across the front of my pulk:

Kia whakatomuri te haere whakamua

I walk backwards into the future with my eyes on the past

By **Laura Andrews,** edited with help from Emily Hunter

Scan the QR Code to view map of the route:

https://antarcticsociety.org.nz/wp-content/uploads/2023/11/LA_South-Pole-Map-Full-Route.jpg

NOTE* Proverb (Māori)

Before the Change
—Scott Base in October 2023

A drone view of Scott Base in October 2023 before redevelopment. The photographer Anthony Powell has also completed a series of Ross Dependency images for a special stamp issue NZPO has just released.

All images by Anthony Powell/Antarctica New Zealand

In the new year, as a fund raiser for NZAS, there will be an opportunity to bid for signed frameable "First Print" photos of each of the original pictures used on the stamps. Packaged with this will be first day covers stamped at Scott Base

THE STRANGE HISTORY OF THE POLISH POLAR STATION

THEY were given almost no notice. A storm was due to hit and the order was made to evacuate.

The small team of Polish scientists retrieved what equipment and data they could from that season's research. They left AB Dobrowolski Polar Station and climbed into the Soviet helicopter. No one knew it would be the last time the facility would be used again for more than 40 years.

The four modest buildings are located in Bunger Oasis in East Antarctica, an isolated and desolate place. Although it is surrounded by ice, including the Shackleton Ice Shelf, the area is mostly ice-free—an Antarctic oasis.

The area was discovered by American pilot Lt Com David Bunger in 1947. He flew across the site as part of Operation Highjump, which some speculate included the search for a secret Nazi base in Antarctica.

The barren site was mapped and named after Bunger, but the Americans soon left. The Soviets arrived in Bunger Hills almost a decade later, establishing a small research station on the shore of Algae Lake in 1956.

At the time, the Polish People's Republic was closely aligned to Moscow, one of several Soviet-bloc countries, having signed the Warsaw Pact. In an act of highly politicised generosity, the four Antarctic buildings were gifted to Poland in 1959. The site was renamed AB Dobrowolski Polar Station, in honour of Polish geophysicist, meteorologist and explorer Antoni Bolesław Dobrowolski.

With Soviet assistance, scientific equipment was installed and a darkroom was built. It would be home to 23 Polish scientists during three expeditions, the last being during the 1978/79 Antarctic summer season, when the base was hurriedly abandoned.

Dobrowolski station is between 80 to 100 km from the coast—depending on the sea ice—and the Polish team only ever accessed it using Soviet helicopters. The collapse of the USSR in 1991 had many consequences. One was Dobrowolski being abandoned and left to the elements.

Inside one of the huts once the work was completed. The team were able to use the rooms and carry out research

Supplied

AFTER a warm introduction, Monika Kusiak stepped out to address the small but supportive Ōtautahi Christchurch audience. A professor at the Institute of Geophysics, Polish Academy of Sciences, she was in the city in late 2022 to discuss an audacious expedition to reclaim AB Dobrowolski Polar Station a few months earlier.

Kusiak was part of a four-strong Polish team that arrived in Bunger Oasis on 8 January, 2022, having spent two months travelling south on a Russian icebreaker.

During her talk at Tūranga (Christchurch Central Library), Kusiak described the scene upon their arrival. It could not have been more bleak. The buildings were far from habitable, meaning the team would have to sleep in tents while repairs were carried out. A roof had collapsed and doors had blown open. The rooms were filled with thick ice. As the smallest of the team, Kusiak had to squeeze through a narrow gap and clear the ice before the others could force their way through.

"We were shocked that nothing was really very damaged," she said. "We came to check the infrastructure and we wanted to know what kind of science we could do there."

Inside, everywhere was a mess. In their rush to leave, the members of the 78/79 expedition dropped everything and rushed to the helicopter. When Kusiak arrived, there were still plates in the sink and food in the cupboards.

"They had no time for proper packing," she explained, "but no one expected it would be such a long break until the next people arrived."

Despite everything, she was optimistic. Over the next 37 days, Kusiak and the team cleared the ice, repaired the buildings and cleaned from floor to ceiling.

"The smell was terrible," she said. "At the beginning we didn't know what to start with,

Monika Kusiak, Wojciech Miloch, Marek Lewandowski and Adam Nawrot spent 37 days at Dobrowolski station

Supplied

there were so many things to do. We were four scientists: we were not professional at renovating and cleaning."

As well as the damage and mess, the outside conditions were harsh. It was bitterly cold and the wind was often too strong to walk against. Their day would start at 7.30am, but they would often still be working at 2am due to the constant daylight. They got what sleep they could: their tents flattened by the gales.

They managed to get the heating up and running and fitted solar panels for power. They installed a generator, replaced the furniture and fixed the toilet. "We tried to make it more civilised," said Kusiak.

Outside the buildings, the site was strewn with litter and debris—glass, metal, batteries, rope cables and porcelain. "Nearly every day we took half an hour or so to fill baskets with the garbage," she said.

Water was collected from the lake, and sometimes it would freeze in their bucket before they got it back.

All outside work had to be done wearing ski goggles to protect their eyes against the sand as it whipped across the barren landscape.

The station was previously used to research Earth science, gravimetry, meteorology and biology.

As well as the two main buildings—named after the Polish cities Warsaw and Krakow—the station includes a small magnetic observatory and a geophysicist's study. "Geologically it's an extremely interesting place because there is a big debate if it was a border between Indo-Antarctica or Australia-Antarctica," Kusiak noted. "We know there are about 40 papers written by Polish scientists, based on their work there."

THE EXPEDITION was Kusiak's second time in Antarctica, having visited Poland's Henryk Arctowski station, on King George Island, in 2011. She was the only female member of the 2022 team and the first woman to ever visit AB Dobrowolski Polar Station. During their five weeks in Antarctica, the four Polish scientists were assisted by the crew of the nearby Russian base, who invited them to dinner and even let them use the sauna on Sundays, their only day off. "Once a week everyone could have a wash. I had 40 minutes to make my body a little bit more human. It was very nice to be warm for 40 minutes per week."

In total, Kusiak and her colleagues—Wojciech Miloch, Marek Lewandowski and Adam Nawrot—spent 37 days at Dobrowolski station, transforming the site and securing its future. As they left the station, they took with them two 20 ft containers full of equipment, items which will be displayed at a museum in Poland, and 381 kg of rubbish.

Kusiak acknowledged that the expedition would not have been possible without support from Russia. But the war in Ukraine means that sort of co-operation is no longer possible. The team were there just weeks before Russia invaded Ukraine on 24 February, 2022, but they were "not really aware" of the situation. "Family wanted to protect us, so they were not telling us too much," she said.

The ongoing conflict meant it was not possible for the Polish team to return in the 2022/23 season and it could be some time before Russian co-operation returns. "How we can get there again? We want to go back, of course. It would be a huge waste if no one would come next season," she said.

During her time in Christchurch, Kusiak met with representatives from other Antarctic national programmes making connections. "Scientifically it's a fantastic place and environmentally it is very important to finish what we started because otherwise the wind will damage everything again. Maybe we could be part of an expedition with New Zealand, Italy or South Korea who could take us back by helicopter?"

Presentation by **Monika Kusiak**
Reported by **Lee Kenny,** NZAS

A Toast to the Antarctic Treaty

At the Wellington Branch 2023 Mid-Winter Event marking her retirement from her role as head of MFAT's[1] Environment Division, Rosemary Paterson raised a toast to the Antarctic Treaty nations.

Photo by IISD/ENB

Rosemary Paterson, as co-lead at negotiations on the Convention on Biological Diversity

THANK YOU for the opportunity to speak to you tonight. I'd like to make two general points.

The first is no doubt to state the obvious in a gathering such as this, but it is to make the point that the Antarctic Treaty System is remarkable and that, despite challenges, we are still able to make progress. Let me expand on that.

More than 60 years ago we agreed to set aside more than 10% of the planet as a place for peace, where the main activity is science, and where cooperation is required.

Forty years ago the Treaty parties recognised the importance of protecting the seas around Antarctica and agreed to strengthen the treaty system with more detailed tools to ensure the conservation of Antarctic marine living resources.

Thirty years ago the Treaty Parties further strengthened the Antarctic Treaty System with the Protocol on Environmental Protection, establishing Antarctica as a natural reserve, protecting wilderness values, intrinsic values, and Antarctica's value for science. The Parties also agreed an unequivocal and unending prohibition on mining in Antarctica.

These tools are remarkable: New Zealand is committed to giving effect to them, and to continuing to strengthen the Antarctic Treaty System to address current and future challenges. It is hard to imagine such strong protection, setting aside a whole continent as a natural reserve for peace and science, being negotiated today.

At the same time, we are all aware of the challenges facing Antarctica and the Antarctic Treaty System.

Climate change is the most pressing. Human activities in Antarctica are growing and diversifying, putting pressure on Antarctica's status as a place for science, and its intrinsic and wilderness values.

I think it is important to stress that Treaty Parties do have the tools to address the challenges in Antarctica:

- research and monitoring to detect change, understand interactions between systems (e.g. ice, ocean, atmosphere, biodiversity) and to reduce uncertainty in the global climate models—and NZ research is crucial in this effort
- management tools to afford special protection to species and areas—including marine areas—and to manage human activities
- the ability to create new tools.

But Parties need to choose to do this. The Antarctic Treaty System is not immune to global pressures on the multilateral system. The pace of decision making has slowed, making it more difficult for the Treaty Parties to take the action they need to take to meet these challenges and fulfil the objectives of the Antarctic Treaty System.

With determination and collegiality, we can still make progress.

The Treaty Parties met in recent weeks in Helsinki for their annual meeting and achieved a lot. They agreed a declaration on Climate Change, decided to launch intensive negotiations towards a binding instrument on regulating Antarctic tourism and resolved to dispel the myth that the Protocol or its mining ban expire in 2048 or at any other time.

Right now, there is an extraordinary meeting of the CCAMLR Commission under way in Santiago focussed on progressing towards agreement on a representative network on marine protected areas—while there may not be any dramatic

Jana Newman, Head of the NZ Delegation to the ATCM (right), and Ceisha Poirot, NZ Representative to the Committee for Environmental Protection (left)

breakthroughs, the steady ground work to build agreement between the countries is continuing.

My second general point is about the importance of the Antarctic ecosystem. I don't mean this in the physical sense. I mean it in the sense of all of those gathered here today and Antarcticans wherever they are.

As Kaitiaki[2] for the taonga[3] that is Antarctica and the ocean surrounding it, we all have roles to play. I acknowledge the presence of Antarctic Treaty partners, policy-makers, scientists, those who provide logistics and ensure the operation of the New Zealand presence in Antarctica. Those of you who have maintained a long association with Antarctica and continue to provide your sage advice. We all have individual roles but our strength lies in our collective action, in particular to overcome the challenges I talked about earlier.

The values of the Antarctic Treaty System are strongly aligned with New Zealand's values: setting aside Antarctica as a natural reserve for peace and science, indefinitely. These values are worth protecting, investing in, and championing, all of us, together.

On that note, please join me in a Toast to Treaty Nations.

Printed by the courtesy of **Rosemary Paterson**

NOTES:

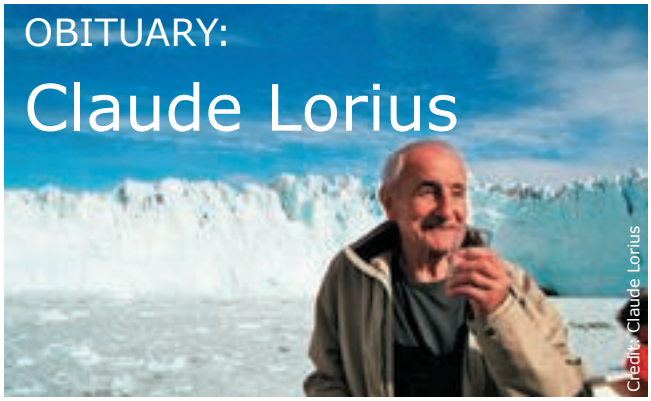
(1) MFAT (NZ) Ministry of Foreign Affairs and Trade

(2) (Māori) Trustee, guardian, caregiver

(3) (Māori) treasure; anything prized for its cultural, social or physical value

Welcome to new Life Member

Emeritus Professor Peter Barrett is a luminary of Antarctic science. His work started in the late 1960s in geology discovering vast sections of new knowledge about the Antarctic. Most notably were the geological drilling projects in the Ross Sea region. He was the founding director of the Antarctic Research Centre at VUW and is currently the Patron of the NZ Antarctic Society and has been the Chair of its Science and Policy Committee advocating for Antarctica and Antarctic Science. Peter continues to dedicate time to raising awareness of Antarctica, seeking its protection, and striving for knowledge and understanding of this continent. He is a NZAS treasure and an inspiration to all who know him.



CLAUDE LORIUS, the esteemed French glaciologist and the only Frenchman to win the Blue Planet Prize, died on 21 March, 2023, at 91.

In 1955, a young Lorius joined a French mission to Antarctica, and discovered his passion for ice. He took part in 22 expeditions to Antarctica and Greenland. An inaugural expert on the UN's Intergovernmental Panel on Climate Change (IPCC), Lorius is known for award-winning research into climate change by studying ancient air trapped in ice cores. Lorius is featured in the 2015 documentary *Ice and the Sky* by director Luc Jacquet. A screening was held 7 November in Wellington by the French Embassy to mark the Paris One Planet—Polar Summit and his memory.

By **BEN MACK,** NZAS journalist

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Vanda Station—

Earlier times and surprises in the dry valleys

Bob McKerrow, Gary Lewis (both geophysics technicians) *Harold Lowe, leader (now deceased)* *Tony Bromley (Met observer)*

DURING the 1969/70 Vanda Station winter, our small winter party witnessed a few unexpected events.

I often like to say we were the most insignificant winter party ever mounted by the NZ Government by virtue of being the smallest. We were four young men living in a hut measuring about 8 x 3 metres, with a modified Shacklock coal range style stove, converted to run on diesel. The hut was supplied with an outdoor dunny, which was an oil drum with plywood shelter, a nail to hang the Tilley lamp on and winter air temperatures approaching minus 57^0 C. At those temperatures, LPG gas lamps extinguished immediately upon being taken outside, whilst the loyal old Tilley kerosine pressure lamps shrugged the cold off and kept going.

During the frequent Katabatic winter winds of up to 97 knots, we had sparks arcing between the radio aerials with gaps of up to 25mm across —around 100,000 volts. We fashioned spark gap contacts to protect our radio equipment from damage.

Arcing is not uncommon where there is blowing snow, but there was no snow. We deduced it might be a blowing dust phenomenon, and devised a method to get empirical evidence. The equipment was built out of modified baked bean cans mounted on a mast which rotated on a buried helicopter transmission drum scavenged from a crash site down the valley.

Conical horns were fashioned and soldered onto the cans to convert high pressure/small displacement at the throat (facing up-wind), into low pressure/large displacement at the mouth (facing downwind into the can). Wind borne dust particles were deposited into the can's calm interiors at various heights up the mast which rotated into the wind via a tail vane. It worked well, producing a particle sizing and composition gradient over the 2.5 metre height of the mast.

Another dry valley surprise was an uncharacteristic lack of acoustic reverberation around the rocky faces. We could always clearly hear helicopters approaching, especially the Iroquois (Huey) in later years, by virtue of their high power long wavelength rotor slap. Here, however, there was little or no 'echo' off the surrounding hills, as we normally used to hear back home, even in bush covered hills, due to the very low rotor frequency producing long wavelengths that reflect well.

Years later, during the 1979/80 summer season, we used high explosives in some of our work, producing shock waves that surprisingly did not reflect back at us off the surrounding mountains, presumably due to absorption.

In our numerous long journeys on foot around the dry valleys throughout the 1970 winter and adjacent summers, Bob McKerrow and I observed that the scree slopes were not mobile like our shingle slides back home on which you can glissade down. Rather, these were softish and dry and even though covered in fist sized rocks, gave the impression of being "powdery" and were energy absorbing to negotiate. Trips of around 7 to 10 hours, walking back to Vanda from Mt Dido or the Labyrinth, were exhausting due to the soft energy-absorbing surfaces encountered wherever we went.

We eventually discovered that sidle travel across the faces about a hundred metres above the valley floor was a less exhausting travel route along the Wright Valley, which tied in with what Arnold Heine and Trevor Chinn had also found.

So the temptation is to attribute the lack of acoustic reverberation to absorption by the powdery surface texture. I have often wondered if geologists might apply acoustic reverberation to remote sensing in order to profile surface texture across large areas.

Another Vanda quirk in hindsight is: from where did we get our breathing air in the hut? The door and windows were firmly sealed for obvious reasons, and the cooking stove had a coaxial flue—outside air feeds the burner via the outer flue sleeve, while the exhaust fumes are expelled back outside via the inner sleeve. No outside air

enters the hut other than when the entrance door leading to the cold porch is opened and closed.

During days of dead calm when our wind generator was stationary, we often relied on pressure fuel lamps for lighting. One could be forgiven for suggesting we might have been spared carbon monoxide exposure by virtue of 3-hourly met and various geophysics observations requiring the door to be opened and closed regularly. Fresh cold air spilled into the hut from the cold porch each time the door was opened.

Because we maintained a 24/7 fire watch, the house mouse spent a lot of time in the lab hut so as not to disturb sleepers in the main hut. The main hut door, therefore, was opened much less often at night. In that event, any carbon monoxide risk might have been countered by no Tilley Lamps or gas lamps running during sleeping hours.

We thought we were pretty smart using clockwork drives for our local and remote chart recorders to minimise dependence on batteries and generators, but forgot to address carbon monoxide risks.

It would be fair to say those early days were wonderfully experimental to a degree more exciting than modern times—with all the adventurous advantages of some measured risk-taking and minimal bureaucracy. Thankfully, we tripped and landed on our feet most of the time.

I was hugely impressed by the simplicity of the entire NZARP programme in the 1960s. It was efficiently run from a tiny cramped office in Featherston Street Wellington, staffed by Bob Thompson, Ken McBride, Arnold Heine, and Jim Froude, assisted by two office clerks whose names escape me.

The kingpin, of course, was Arnold Heine: he amazingly prepared everything pertaining to field operations pretty much single-handed, with good results.

Perhaps Omar Khayam had some mystical insight to the motivation of OAEs with his one liner:

"The enquiring mind to solitude retires"

By **Gary Lewis,** MRSNZ, PM
NZ Police long service medal, Leader Vanda 1979/80, Senior technical officer 1969.

L to R: Gary Lewis & Bob McKerrow

For hygiene purposes, our toilet at Vanda Station was outside. Here is Tony Bromley on the thunder-box. When it got below -40^{0}C. it was dangerous as one's backside would stick to the painted seat and rip skin off. To solve this problem we made polystyrene seat covers to protect our bums.

Gary Lewis having a luxury wash in the bath tub at NZARP's Vanda Station in winter 1970

NOTES:

Vanda Station—since removed, and the site flooded by lake water—was located on the south east edge of Lake Vanda, located in the Wright dry valley, about 80 nautical miles west of McMurdo. Vanda was the only NZ station ever located on the Antarctic mainland—Scott Base is on Ross Island. If you have Google Earth, you can search "Wright dry valley Antarctica" and zoom in on Lake Vanda. The station was located near to where you can see the Onyx River entering Lake Vanda.
Glossary: OAE is an acronym for "Old Antarctic Explorer" originally a colloquial endearment, but is now widely used in Antarctic folklore.

William Crawford, IODP JRSO [Photo: 374_195]

Giant underwater landslides in the Ross Sea

THE ROSS SEA is largely a tectonically inactive region, and therefore risks associated with submarine landslides are largely overlooked. However in 2022, an international team of scientists from two scientific cruises published results in *Nature Communications*[1] documenting giant underwater landslide features in the outer Ross Sea continental shelf.

The landslides were discovered in the eastern Ross Sea in 2017 by an international team of scientists during the Italian ODYSSEA expedition. Scientists then revisited the area in 2018 as part of the International Ocean Discovery Program (IODP) Expedition 374 where they collected sediment cores extending hundreds of meters beneath the seafloor. They revealed that these extensive landslides formed beneath layers of weak, fossilised biologically-rich sediments hundreds of metres beneath the sea floor and more than 100 metres into the seabed. These weak layers were formed by the deposition of vast quantities of very fine grained biological material deposited during past warm climates and formed inherently slippery layers.

The warm events in question occurred during the mid-Pliocene warm period, circa 3 million years ago, and the Miocene Climate Optimum, circa 15 million years ago. These are periods when atmospheric CO_2 levels exceeded 400 parts per million and climates were more than 2˚C warmer than at present. However, this was not the timing of the landslides. It only represents the timing of the depositions of the planktonic rich sediments during the bloom events. During subsequent cold climates/ice ages these slippery layers were overlaid by thick layers of coarse gravels delivered by glaciers and icebergs.

These combinations of climate events created a layer cake of sediments with highly contrasting levels of cohesiveness. Such areas are susceptible to failure in the face of earthquakes and other seismic activity. The research team proposed that at the end of the ice ages that deposited the gravel layers, the removal of a heavy ice sheet on the Earth's crust resulted in the uplift of the sea bed—a process known as isostatic rebound. This acted to tilt these high layer sediments and resulted in the coarse gravel sliding over the top of the slippery biological layers, and vast quantities of sediment to catastrophically slide off the continental shelf edge as one giant sheet.

Submarine landslides are a major geohazard with the potential to trigger tsunamis that can lead to huge loss of life

Similar drivers of landslides in the Northern Hemisphere have generated tsunami waves that killed residents along the Newfoundland coast, impacted the coast of Portugal, and caused significant economic damage by severing trans-Atlantic telecommunications cables. With the planet currently going through a period of extensive climate change, the

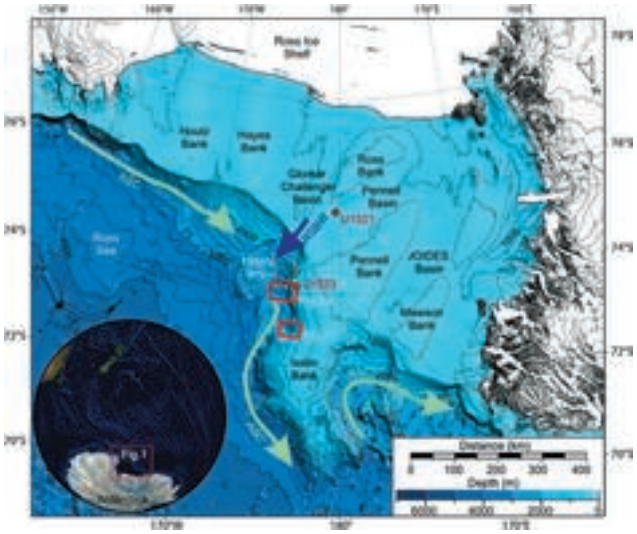


Fig. 1: Location of study area on the Ross Sea margin. From: Climate-controlled submarine landslides on the Antarctic continental margin
Source: https://www.nature.com/articles/s41467-023-38240-y/figures/1

For an enlarged view of the map scan this QR Code:

researchers believe there is the potential for such incidents to be replicated.

The study, led by Dr Jenny Gales of the University of Plymouth, notes, "Submarine landslides are a major geohazard with the potential to trigger tsunamis that can lead to huge loss of life. The landslides can also destroy infrastructure including subsea cables, meaning such future events would create a wide range of economic and social impacts. Thanks to exceptional preservation of the sediments beneath the sea floor, we have for the first time been able to show what caused these historical landslides in this region of Antarctica and also indicate the impact of such events in the future."

However, whether such events could occur in the face of modern climate change is unknown at this stage. It is likely that any future ice sheet melt would not affect the uplift of the outer continental shelf in the same way, as the current ice sheet margin is further inland. The isostatic rebound mechanism for triggering this event is something that needs to be further assessed, and was hard to fully test in the cores recovered by IODP Expedition 374.

What can be said with a lot more certainty is that the types of sediment being deposited by these past climate changes have resulted in a region that is highly susceptible to large submarine landslides. Isostatic rebound was proposed as a logical potential trigger. However, it could be random failure. Or, climate regulated shifts in ocean currents could erode sediment at key locations on the continental shelf and trigger slope failure. Computer models could assess these scenarios in future studies.

It is also unknown what the impacts for a Southern Ocean tsunami source would be for Southern Hemisphere populations, or for infrastructure relating to Antarctic bases in the Ross Sea. However, numerical computer models exist that could predict these potential risks.

There are also plans for laying submarine cable infrastructure to the Ross Sea research stations. Documenting the locations where submarine slope failure is most likely to occur is critical to informing such a project.

By **Rob Mckay,** co-chief scientist of International Ocean Discovery Program (IODP) Expedition 374 to the Ross Sea

Justin P Dodd

Dr Jenny Gales (right) and Professor Rob McKay examine the half-section of a core recovered from the Antarctic seabed

The landslides can also destroy infrastructure including subsea cables, meaning future such events would create a wide range of economic and social impacts

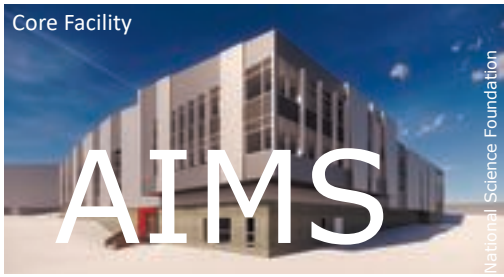
William Crawford, IODP JRSO *[Photo: 374_192]*

Snow covers the pipe racker during Expedition 374

REFERENCE

(1) The full study—Gales et al: *Climate-controlled submarine landslides on the Antarctic continental margin*—is published in *Nature Communications*, DOI: 10.1038/s41467-023-38240-y or (https://www.nature.com/articles/s41467-023-38240-y)

McMurdo's big AIMS



After pandemic-related delays, a multi-million-dollar refurbishment of McMurdo Station is in full swing. We look at some of the key projects.

SCOTT BASE isn't the only research station in the Ross Dependency undergoing major changes. Work is also underway 3km away at McMurdo Station, operated by the United States of America (USA).

Among the biggest projects is the Antarctic Infrastructure Modernization for Science (AIMS). US$410.4 million has been requested from the Congress for AIMS, funded by the National Science Foundation's (NSF) Major Research Equipment and Facilities Construction Funding (MREFC)[1].

The two AIMS projects in progress are the Vehicle Equipment Operations Center (VEOC), and a new Lodging Facility[2].

Located uphill from the rest of the station at the site of Warehouse Buildings 340, 341 and 342 (which were demolished in the 2019-2020 summer season), the VEOC will replace the existing Vehicle Maintenance Facility. It will have six vehicle bays (five heavy and one light), shop space, offices and parts storage[3].

The new Lodging Facility replaces the 203A/B/C lodging facility. Overlooking Winter Quarters Bay, it will have 285 beds, spread across 42 double rooms and 201 single rooms. Each room will have a TV, and every floor will have lavatories and common areas, similar to student dorms at many American universities.

Much of the work on the ice is being done by Leidos—the main civilian contractor the U.S. Antarctic Program (USAP) uses—and construction firm Parsons.[3] Construction was delayed for two years due to the COVID-19 pandemic, as during that time very few people were able to visit McMurdo and other USA-operated Antarctic stations. Visits often involved stays in Managed Isolation and Quarantine in New Zealand before deployments to the ice.

The delay means the new Lodging Facility is not expected to officially open until March 2025, while the VEOC is scheduled to open in November 2025.

Other projects in the works at McMurdo include the Core Facility. With 261,000 square feet (about 24,250 square metres) of space, it is planned to eventually house station management and administration, communications, food services and storage, and more[4].

The Field-Science Support Center is another project. Supporting scientists heading into the field for research, the facility will include cargo consolidation and field gear storage. It is to be located across the road from the existing Crary Science and Engineering Center[4].

Also underway are efforts to improve McMurdo's Internet speeds. Broadband capacity was doubled in 2022 with the construction of an earth station called Very Small Aperture Terminal (VSAT). Construction has also been completed of a four-storey satellite station in the hills above McMurdo, which will replace the station on Black Island, about 32 kilometres (20 miles) away[5].

USAP is also working with the U.S. Army Corps of Engineers (USACE) on a new floating barge pier at McMurdo. At 30.5 metres (100 feet) wide and 100 metres (328 feet) long, it will be permanently moored in Winter Quarters Bay, replacing the old ice piers. The new pier is expected to be delivered in February 2026[6].

By **Ben Mack**, NZAS journalist

MORE ABOUT AIMS

https://future.usap.gov/what-is-aims/
https://future.usap.gov/foundation-of-aims/
https://future.usap.gov/faq/

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NZ ANTARCTIC SOCIETY

Addendum

to the list of Awards and Honours

Prepared by: **Mike Wing,** NZAS

Additions to the list of New Zealand recipients of The Polar Medal and The New Zealand Antarctic Medal

(*Antarctic* Vol. 40, 1 & 2, pp. 23-25)

Note: * = NZ resident but not born in NZ

POLAR MEDAL

Awarded 1987
For outstanding service to British Polar Exploration and research
Bryan Cecil STOREY *
Geologist
With Clasp "Antarctic to 1984"

Awarded 1995
For outstanding achievement and service to British Polar Exploration and research
Neil Stephen GILBERT *
Marine Biologist and Base Commander
With Clasp "Antarctic to 1994"

THE NEW ZEALAND ANTARCTIC MEDAL

Awarded 2022
For services to Antarctic Science and Conservation
Ian HAWES
Fresh Water Scientist

Awarded 2023
For services to Antarctic Heritage Preservation.
Nigel John WATSON
Executive Director Antarctic Heritage Trust

OTHER HONOURS: ADDITIONS

Recently noted additions to the list of New Zealand recipients of other Honours relating to Antarctic Service

(*Antarctic* Vol. 40, 3 & 4, pp. 24-25)

Awarded 1963
Edwin Ian ROBERTSON
OBE
Officer of the Order of the British Empire

Awarded 1979
Peter Jensen Reid SKELLERUP
OBE
Officer of the Order of the British Empire

Awarded 1981
Edwin Ian ROBERTSON
CBE
Commander of the Order of the British Empire

Awarded 2008
John Ross (Harry) KEYS
ONZM
Officer of The New Zealand Order of Merit

Awarded 2020
David Osborne CRERAR
MNZM
Member of The New Zealand Order of Merit

HONOURS
(Other than The Polar Medal and The New Zealand Antarctic Medal)
Medals are listed in order of precedence. The full list of New Zealanders to receive Honours that include reference to Antarctic service are:

Edmund Percival HILLARY
KG (1995)
Knight of the Order of the Garter
ONZ (1987)
Member of The Order of New Zealand
KBE (1953)
Knight Commander of the Order of the British Empire

Robert George Mappin FENWICK
KNZM (2016)
Knight Companion of The New Zealand Order of Merit
CNZM (2008)
Companion of The New Zealand Order of Merit

Christopher Robert MACE
KNZM (2016)
Knight Companion of The New Zealand Order of Merit
CNZM (2005)
Companion of The New Zealand Order of Merit

Robert Alexander FALLA
KBE (1973)
Knight Commander of the Order of the British Empire
CMG (1959)
Companion of the Order of Saint Michael and Saint George

Joseph Holmes (Bob) MILLER
KB (1979)
Knight Batchelor
OBE (1958)
Officer of the Order of the British Empire

Edwin Ian ROBERTSON
CBE (1981) Commander of the Order of the British Empire
OBE (1963) Officer of the Order of the British Empire

Baden Nolan NORRIS
QSO (1977)
Companion of the Queen's Service Order

Richard Gerald McELREA
QSO (2017)
Companion of the Queen's Service Order

John Ross (Harry) KEYS
ONZM
Officer of The New Zealand Order of Merit

Paul HARGREAVES
ONZM (2007)
Officer of The New Zealand Order of Merit

Trevor HATHERTON
OBE (1958)
Officer of the Order of the British Empire

Peter Jensen Reid SKELLERUP
OBE (1979)
Officer of the Order of the British Empire

Robert (Bob) Baden THOMSON
OBE (1981)
Officer of the Order of the British Empire

Gillian WRATT
MNZM (2004)
Member of The New Zealand Order of Merit

Paul Douglas WOODGATE
MNZM (2012)
Member of The New Zealand Order of Merit

David Osborne CRERAR
MNZM (2020)
Member of The New Zealand Order of Merit

Arthur HELM
MBE (1959)
Member of the Order of the British Empire

Leslie Bowden QUARTERMAIN
MBE (1967)
Member of the Order of the British Empire

Inspector Robert Stronach MITCHELL
MBE (1981)
Member of the Order of the British Empire

Francis John STANTON
MBE (1981)
Member of the Order of the British Empire

Hugh Francis Malcolm LOGAN
QSM (1981)
Queen's Service Medal

Colin Chalmers MONTEATH
QSM (1981)
Queen's Service Medal

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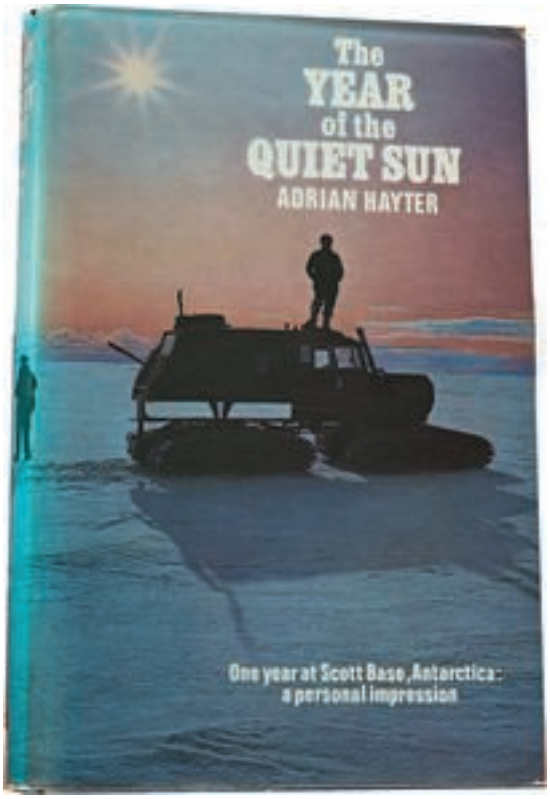
The Year of the Quiet Sun
—a leader's perspective



In 1968, Adrian Hayter presented his four-year-old daughter with a copy of his latest book, "for when she grows up". With his book as her guide, Rebecca Hayter pays tribute to her father's qualities as leader of Scott Base, wintering over party 1964-5.

AS a yachting journalist, I've written much about my father, Adrian Hayter, the first New Zealander to sail single-handed around the world. His book *Sheila in the Wind* about that voyage became a sailing classic. His second book, *The Second Step*, chronicled his military career which included his role as a British officer with a Gurkha regiment in the Second World War, the Military Cross and being made a Member of the British Empire.

Among such exploits, his year as leader of Scott Base tends to rate just a sentence or two in his life story. His book, *The Year of the Quiet Sun —one year at Scott Base, Antarctica: a personal impression*, was well-received, but my sister Sarah and much preferred his bed-time stories about Peter and Jenny Penguin. They leapt and dived between ice floes, usually with a fearsome leopard seal in pursuit.


Hayter family archives

Rebeca Hayter, the author and daughter of Adrian Hayter

As leader, Adrian's primary role was to coordinate the various logistics that allowed the scientific field parties to complete their projects over summer. In 1964, it was only 15 years since he had seen active wartime service and just two years since he had completed his circumnavigation. The military had demonstrated to Adrian the far-reaching impacts of good and flawed leadership. Solo sailing had taught him to hear his inner voice and that the weather's decision is final.

At the time, women weren't permitted at Scott Base and, as an extreme location, it attracted a rare breed of men: staunchly independent, even eccentric. Exactly the sort of men Adrian admired. In fact, he had sought them out:

> *…during the interviewing to select candidates, I sought to choose only individualists, fully knowing the risk I took and the disintegration that could result. But Antarctica to me provided a unique opportunity to experiment in my favourite field and the need to experiment in this matter was my own deep private reason for accepting the position of Leader. I had already proven the practicality of this ideal during a lone enterprise; but now I wanted to discover whether, by applying the same principles, it could be equally practical with a group.*

The 'lone enterprise' referred to was his solo circumnavigation. Adrian believed the isolation of Antarctica brought the opportunity to go inward, connect with 'self', to trust intuition. He never undertook any endeavour without deep thought beforehand and reflection afterwards.

Any leader who demands loyalty from his group to satisfy his own personal motives, however these may be disguised from himself and others, will receive little real loyalty from individualists. My plan was to administer each man and task in such a way as to encourage individuality, thus placing each man in the most favourable position to discover this reward for himself, the only way it can be found. It is unique to each individual, but it is also common to all men, and being in common to all thus may become a coordinating factor as individual paths converge towards it.


Hayter family archives

Lifting a husky into a helicopter from McMurdo

Any reader of Adrian's books will recognise his introspective nature, but mostly *The Year of the Quiet Sun* is a leader's report—the thrill of aircraft landing or taking off in marginal conditions, the field operations, his wrestling with his team's adoration of the American way at McMurdo versus the basic facilities of Scott Base, and the agony of decision when a scientist in the field developed severe abdominal pains. I wonder now if being married to my mother, a doctor, helped Adrian to correctly suspect appendicitis and urgently request an evacuation flight from McMurdo.

So his conclusion to *The Year of the Quiet Sun* is the place for Adrian Hayter philosophy:

> Only on the completion of an experience, and perhaps with removal from it to another environment, are we able to observe it and draw sensible conclusions. My own deepest impression of Antarctica now is the fact that the values we lived there often contrasted so sharply with conventional values practised elsewhere.


On an ice lake (name illegible)

Hayter family archives

One of his favourite sayings was: "Inflexible in principle, flexible in application". It makes a brief appearance in *The Year of the Quiet Sun*, albeit thinly disguised. Another was the belief that for harmony to exist, the giving and receiving must equate. That shaped his objections when members of his team casually borrowed items from McMurdo.

Which leads to another aspect of Antarctica that resonated with Adrian: it's never seen war and is the only continent on Earth unowned by any country.

Heaven knows we had our disagreements at Scott Base, often due to my own faulty leadership, when the drop in the team's morale made it obvious that I was on the wrong track. But somehow we stuck together, the men themselves carrying me through my periods of failure, and I came away with the belief that if those principles are practical when applied to a small isolated group, then those same principles would be equally successful if reapplied to a nation. This of course is democracy, which today is claimed by many but in truth is practised by none.

I believe that in that strange awareness which may be found in Antarctica rests that other sacred half necessary to complement our materialism and technology, to bring more sense to our world as a whole. And to fill this need is why some men go South, if only because the continual invasion of our privacy makes it almost impossible to find at home. I also believe that this secret key, if understood, is the most valuable discovery ever likely to come out of Antarctica.

Adrian cutting his 50th birthday cake

Mid-winter Christmas dinner: Adrian is the head of the table

I don't believe Adrian is saying that everyone needs to go to Antarctica to achieve a greater understanding, but that we do need to go to a place of isolation. And, to come back.

My earliest memory is of being on my mother's hip and my father smiling as he walked towards us across tar seal. Maybe it's the creation of a child's whimsy, but in my mind, he had just returned from Antarctica.

Three years later, the Newman's bus dropped off a cardboard box outside our house at Upper Takaka. Adrian placed it on the dining table and cut the string with a pocket knife. I still sense his quiet thrill of anticipation as he held the first copies of *The Year of the Quiet Sun*. In my copy he wrote: "For Beckie, for when she grows up."

For all the articles I have written about my father, this is the first time I've written specifically about his time at Scott Base, so, as a grown-up, I re-read *The Year of the Quiet Sun*.

Many of us in our careers accommodate the skills and flaws of our leaders. Many leaders/managers are happy to hit the performance targets and stay on the right side of the HR department. But Adrian was a conscious leader. He had a requirement at Scott Base that if anyone came to him with a problem, that they also brought at least one possible solution—a tactic that often meant the man resolved the problem himself. Adrian constantly monitored his own performance against team morale, individual motivation, and was aware of each man's dilemmas in regards to his family in New Zealand versus his responsibilities at Scott Base.

Adrian must have felt that dilemma keenly when he received a message from my mother, via the Antarctic Division, to say that I'd drunk kerosene from a soft drink bottle I'd found in a friend's garage. In one version of the story, the message got garbled and reported that I'd died. The all-clear came through a day or two later.

Adrian doesn't mention it in *The Year of the Quiet Sun*, and probably didn't mention it to anyone at the base.

So, how did Adrian's peers evaluate him as leader of Scott Base? For his 50th birthday, one of the field parties, officially the New Zealand Geological Survey Antarctic Expedition 1964-5, arranged to gazette the 2,690 m (8,830 ft) Mount Hayter. To be fair, they were naming several features for their friends at the time.

In Adrian's papers, I found an undated telegram from Jehu Blades, Officer-in-charge at McMurdo:

1. Upon completion of the wintering period at this station I want to express my profound appreciation for the outstanding cooperation of the men of Scott Base under the exceptionally capable leadership of Major Adrian Hayter.

2. Under the trying conditions of isolation and a hostile environment when close cooperation is essential and yet not always easy to achieve, mutual problems were invariably resolved effectively and amicably thanks to the wide experience and skill of Major Hayter.

3. The many services, such as the voluntary training of our search and rescue group by Scott Base experts, which have been rendered to us have done much to further the accomplishment of the mission of this station.

IN 1970, Adrian was awarded the Polar Medal for services to Antarctica. But the real score sheet came from the men of Scott Base, many of whom remained close friends until Adrian's death in 1990. At Adrian's request, his deputy leader, Mike Prebble, was one of his pall bearers.

As for me, I've never been to Antarctica, but I know that among the creak of crevasses is a sparkling ice shelf, the magical home, the secret wisdom of Peter and Jenny Penguin.

By **Rebecca Hayter,** www.rebeccahayter.co.nz

Jack Hoffman, PM —Antarctic Driller

Antarctica New Zealand Pictorial Collection, Image TAE-0548. 1957.

Fig. 1: Jack Hoffman with the minidrill and compressor

JACK HOFFMAN deserves being remembered for setting the scene for Antarctic drilling, in particular geological drilling. After extensive drilling experience in New Zealand in the 1940–50s, including the first 'deep' geothermal wells[1], he joined Geophysics Division, DSIR, and in 1957 started drilling in Antarctica with the tie-down holes for the Scott Base buildings during the establishment of Scott Base and the NZ Antarctic research program.

These holes required clean dry holes. He used the novel concept of compressed air to clear the holes of drilling fines and prevent permafrost melt. Jack was well prepared with a mini-drill and a portable compressor driven by the belt drive on the Fergusson tractors (Fig. 1). This was the first use of this technique in Antarctica and Jack was complimented on his work by Helm and Miller[2]. Many decades later the same method was used for the permafrost sediment drilling at, for example, Lake Vanda and Alan Hills in 2000–1[3] and at Friis Hills in 2016. In these latter cases the larger volume and higher-pressure supply of air, needed for the deeper wider holes, required refrigeration to combat adiabatic heating.

Jack returned to Scott Base in the 1957–8 season to support work by the NZ Ministry of Works expanding Scott Base. He subsequently supervised the drilling of 29 foundation holes (average depth 10 m) for the nuclear power station for the US Antarctic Research program using the Geophysics Division, DSIR, Sullivan 37 drill rig, flown down in a US Globemaster (Fig. 2) during 1960–61[4]. This experience led to Jack being consulted on drilling for the international (US, Japan, New Zealand) Dry Valley Drilling Project (DVDP) in 1971. Jack advised the use of a wire-line mineral drilling rig and the use of diamond drill bits for clean cores. A Longyear rig was purchased by the US program with NZ DSIR providing the drilling management (drilling superintendent and lead driller—Geophysics Division) and drillers, assisted by a Longyear representative (Martin McGale). Jack was the drilling superintendent with Leon Oliver acting when Jack was not available. Fifteen holes were drilled in 3 seasons. Jack designed and constructed the sediment sampling device for DVDP 4 at Lake Vanda in 68 m water depth where he also had to set up and support casing for the drill rod through the water layer. The sediment sampler was subsequently used at other DVDP sites. Lake Leon, where DVDP 12 was successfully drilled, was named for Leon Oliver who oversaw the drilling[3].

Drilling moved offshore with DVDP 15, which was drilled from the sea ice. Jack advised and resolved the initial difficulties encountered with this activity, including the use of a sea riser anchored to the seafloor, floats on the sea riser to take some of the weight off the sea ice and allow the riser to be under tension. This technique resulted in over 95% core recovery in sea ice-based drill holes subsequent to DVDP15. After the DVDP program concluded, Jack was consulted by the US National Science Foundation on the USGS proposal to drill the Dufek Massif.

In the 1977 New Year's honours list, Jack was awarded the Polar Medal, the citation noted he had completed 28 visits to Antarctica. He was also reputed to have had one of the shortest visits—less than 24 hours there, solve the problem and back home, and that using C130s.

Jack transferred temporarily to Samoa in 1978 as Superintendent of the Apia Observatory for a year. As well as managing the observatory program, he directly oversaw the freshwater drilling program underway as a MFAT overseas aid project. As a result, Jack was not involved with the MSSTS–1 drilling project in 1979 but continued, with Geophysics Division support, as Drilling Superintendent for the NZ Antarctic drilling

programme for the following CIROS–1 (1986) and CIROS–2 (1984) drill holes. Here he emphasised the use of a mud program to control the core quality from the borehole and achieve a high degree of core recovery. These geological drilling projects were part of the NZ Antarctic Research Program with international scientists participating.

At the end of CIROS-1 it was decided to move to a more formal international consortium as logistics cost were getting high. The next target was a ridge off Granite Harbour—later known as Roberts Ridge. The June 2023 article in *Antarctic* on VUW Antarctic Expeditions was not clear about the project's genesis. It was Dave Bennett in 1980 who recorded, on seismic data from *USCGS Glacier,* the sedimentary layers dipping from very close (< 2 m) to seafloor at Roberts Ridge deep into the Victoria Land Basin to the east—an ideal target for a vibracorer that can penetrate several metres into the seafloor. As VUW were developing a vibracorer, Dave and I proposed a programme of cores at sites down the slope to sample the whole sequence. However, this did not eventuate eventuate and the drilling target became CIROS-3. In 1984 Alan Cooper and I recorded a MCS profile from *USGS R/V SP Lee* across Roberts Ridge extending the seismic stratigraphy from the *Glacier* profile deeper and further into the Victoria Land Basin. As the project developed further, it became known as the Cape Roberts Project.

Jack and his drilling group drilled very accurate vertical holes for 3-component bore hole seismometers in NZ in 1975 for the SRO (Seismic Research Observatory) Makara seismometers. The verticality accuracy called for < 3°, but 0.3° was achieved. They were therefore asked in 1985 to drill 100 m and 300 m deep holes for the two 3-component seismometers (VNDA) at Bull Pass in the Wright Valley for the USGS seismology program based in Albuquerque. They used the US Longyear drill rig. The vertical accuracy achieved was within 0.3° and 0.5° [5].

Jack retired in 1987 but his legacy continued: a drill rig and experienced Antarctic drilling staff were available through the New Zealand program. In 1991 we were thus able to provide a basis for a drilling project to attract interest and resources from several countries.

In 1991 the drilling group built a lightweight drilling rig for shot holes in the iceshelf for the Hut Point seismic survey in 1991[6]. This was very similar to the one Webster Drilling built for seismic work in the 2010s mentioned by Jeff Ashby in his Sir Holmes Miller Lecture of NZAS earlier this year. The group continued for a couple of years drilling highly accurate, but expensive, vertical drill holes for 3-component borehole seismometers around the world before the group was disbanded.

NZ government science was restructured in 1992. The new institute IGNS—now called GNS Science—that replaced the DSIR earth science divisions, allocated large general overheads onto the ex-DSIR drilling group. The group then became financially nonviable; in his lecture, Jeff Ashby noted "small and nimble" were essential for viability. Drilling for Cape Roberts was therefore undertaken by a unit set up by Antarctica NZ with Jim Cowie as the project manager. Peter Barrett and I were the NZ co-principal investigators with NZ resources equally coming from IGNS (scientists and capital) and VUW (science staff and students). Peter took the science lead and I looked after the International Steering Committee aspect. The project was not finished in the planned 2 years, and IGNS secured funding for the NZ science contribution for the third year.

As well as his leadership in active drilling, Jack set up the well drillers training course for the NZ Drillers Federation at the NZ Technical Correspondence Institute and was elected the first honorary member of the Federation[7]. Jack left a lasting drilling legacy.

By **Dr Fred Davey,** formerly Director, Geophysics Division, DSIR

ABBREVIATIONS: DSIR: Department of Science and Industrial Research; IGNS: Institute of Geology and Nuclear Science; VUW: Victoria University of Wellington, NZ.

REFERENCES—SEE PAGE 37

Hatherton (1980) Fig 39

Fig.2: Rig and Globemaster

Scott Base Redevelopment UPDATE

It's a busy season at Scott Base as Antarctica New Zealand considers its next steps

Proposed new Scott Base—see the centrefold for how it is today

WORK AT SCOTT BASE is continuing this season, despite Antarctica New Zealand not coming to an agreement with the construction company helping with the base's redevelopment.

Leighs Construction was selected over four competitors as the preferred contractor to build modules for the redeveloped base in Timaru, which would then be delivered to the ice by boat in January 2027—70 years after Scott Base opened in 1957. In June this year, *Timaru Herald* reported that the redevelopment price tag had risen by almost $160 M[1]. Antarctica New Zealand hasn't yet been able to reach an agreement with Leighs.

"Antarctica New Zealand will now consider a range of options on how to progress the project," said Antarctica New Zealand Chief Executive Sarah Williamson in a statement on 10 October 2023[2].

"This options analysis is expected to take ten weeks, utilising a team of external and internal experts. Some of the work already underway at Scott Base will continue in preparation for a recommended option. This includes the upgrade to the Ross Island Wind Energy system."

Not yet coming to an agreement also doesn't mean work isn't happening.

"While the options analysis is completed, some of the work already underway at Scott Base will continue in the 23/24 season in preparation for a recommended option," said Williamson.

"This includes work to ensure the base remains safe for those living and working there, along with some enabling works, environmental monitoring and baselining. Leighs Construction will continue to manage some of this work at Scott Base under an early works contract.

"Antarctica New Zealand continues to have good relationships and open communication with Leighs, and our important stakeholders. We will now await the outcome of the options analysis to inform next steps."

Antarctica New Zealand has received $498 million from the New Zealand Government to rebuild Scott Base. The amount includes funding for renewing the Ross Island Wind Energy system.

"Maintaining a presence in Antarctica is of strategic importance to New Zealand," Williamson also said. "It is imperative that Antarctic and Southern Ocean science continues to investigate how the continent and its ecosystems will be impacted by climate change, and how those changes will influence the rest of the planet."

By **Ben Mack,** NZAS

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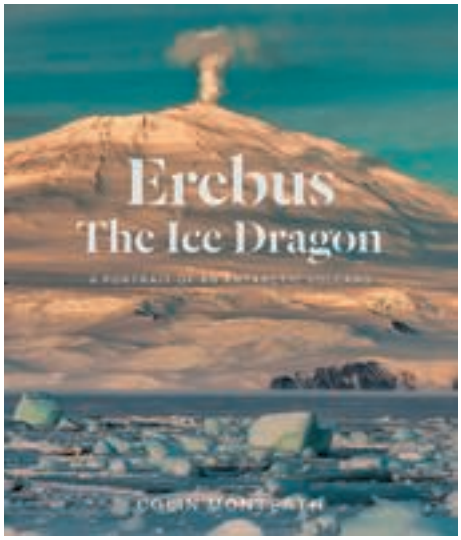
Book Review Erebus The Ice Dragon

A PORTRAIT OF AN ANTARCTIC VOLCANO
BY COLIN MONTEATH

ISBN: 978-1-99-101636-2
Massey University Press



Massey University Press

From a deeply evocative foreword written by scientist Peter Barrett, to the end of the final chapter, this definitive book on one mountain in Antarctica is remarkable. It brings together history, exploration, mountaineering, science, adventure, art and reflections on the 1979 Ross Island Air Crash. It is a captivating book for all ages. The reading style is fascinating and the pages glide by quickly. The maps, photos and illustrations kept me riveted, wanting to read the book in one go.

The first three chapters are about origins of the name Erebus, the mountain's fiery nature and a fine overview of volcanoes on Antarctica as well as its discovery in 1841 by Captain Sir James Ross. Monteath describes Ross's qualities as a Captain and the solid design of his two ships in considerable detail.

The chapter 'No Latitude for Error' on the Air New Zealand crash on Erebus in 1979 was the one the author left for last to write as he knew it was going to be a very difficult and emotional for him: he was one of the members of the rescue team and is still haunted by the rescue mission today.

Four of the rescue team skilfully drew from their personal diaries and contributed individual reports to the chapter.

Personally, I found these accounts to be the most gripping chapter of the book as I learnt so much. The subject of the Air NZ Crash is revisited again in the final chapter with poets and artists.

In his foreword, Peter Barret, (NZAM, FRSNZ, FRG (Hon), Emeritus Professor of Geology and Founding Director, Antarctic Research Centre) gets quickly to the nub of the book:"For me, the heart of the book is Chapter 7, aptly titled 'The heartbeat of Erebus'. It describes how, between 1972 and 1978, the team led by Phil Kyle worked to understand just how the active volcano came to be the feature we see today; the technology they drew on and developed, and the considered risks they had to take. They paved the way for the exciting scientific work that followed two decades later."

What surprised me was the variety of scientific disciplines being studied in and around the volcano caldera on Erebus. Geochemists studying the chemical composition of the gasses, geologists studying rocks and crystals and microbiologists classifying plants and microbes that prospers in the hot soil. Meanwhile, some 50 km away at Scott Base, seismometers record summit activity.

French volcanlogist Haroun Tazieff is quoted in the chapter 'Heartbeat of Erebus' as saying "Another hero, Edmund Hillary, had just returned from the South Pole. We spent an evening together talking about Erebus..."

Ed Hillary is not only seen as a hero and an icon for doing the first ascent of Everest, but also for leading a team of Kiwis on farm tractors from Scott Base to the South Pole. So whilst we have a NZ born mountaineering/exploration hero in Ed Hillary, after reading *Erebus, The Ice Dragon* Phil Kyle must rank as a NZ Antarctic science hero, with Trevor Hatherton and Peter Barrett close behind.

The chapters on the early ascents of Erebus exemplify hardships and a raw pioneering spirit for science, map making and conquest.

In 1908, with four months of darkness approaching their base at Cape Royds, Shackleton backs Prof David's suggestion of an ascent of the unclimbed Erebus. The team made a successful first ascent and brought back some excellent scientific knowledge. This is another example of Shackleton's ability to manage and motivate team members, sometimes by poetry, sometimes by example.

Equally interesting is the chapter on the second ascent of Erebus in December 1912 by members of the British Antarctic Terra Nova Expedition. A

geology of the summit caldera wss undertaken, increasing the scientific knowledge of the mountain.

The 3rd ascent was by HMZ Pemmican which sailed on Erebus with John Harrison, Alan Beck and Wally Romanes aboard a Nansen sledge in 1959. They man-hauled most of the way up, but set sail on the way down.

In Chapter 9 Dr Strangelove goes to Erebus and a Barking Mad Kiwi attempts to climb Erebus with two teams of dogs. Strangelove is about a US Navy contractor who decided to climb Erebus solo, without approval in 1981. He left a note on his bunk and was half way up the mountain before his note was discovered. The Scott Base rescue team were summoned to the 'top brass' at McMurdo to help rescue him. The author goes Barking Mad on Erebus with two teams of dogs until one dog handler cuts his hand with a chisel, and they are reduced to one team with 11 huskies.

And there is mention of a clandestine solo ascent of Erebus by Charlie Beckner in 1991.

While author Colin Monteath has researched and written the book to reflect all the cultures and countries that have impacted Erebus, the New Zealand Antarctic story comes across strongly of field teams staffed by hardy and adaptable people who are able to operate on a shoe string. In the words of Gary Lewis, NZARP's radio expert who wintered over at Vanda Station in 1970, “Kiwis have consistently performed in the field under near-impossible conditions with little more than a shrug and ‘get on with it’."

Monteath explains a maturing process of NZ work in Antarctica, and many OAEs refer to it as the 'Heine' era. "The 1960s was the decade when the New Zealand Antarctic Programme (NZARP) came of age. Each summer, long-range reconnaissance field parties set out from Scott Base, flying into the mountains in US Navy ski-equiped aircraft to land in remote glaciers. These expeditions undertook mapping and geological sampling throughout the Transantarctic Mountains. Initially these parties relied on two 11-husky teams, each pulling a heavy sledge with supplies for two months."

Chapter 13, the last chapter, ‘Shaping a volcano—Erebus and the artistic imagination’ crafted by Adele Jackson, is the one I got the most out of as there were so many aspects of this chapter I could identify with. I had spent 13 months in Antarctica in 1969-70, the summer under the shadow of Erebus at Scott Base and ten months at Vanda.


Peter Otway

Colin signing his book at its launch at Antarctica NZ, Christchurch, on Friday 11 August, 2023

Mount Erebus in particular has inspired poetry, paintings, photographs, books, films and theatrical productions. All of the leaders of Antarctic Expeditions in the heroic era from the English speaking world loved the poets Tennyson, Robert Service, Keats, Kipling, Browning and others.

Recently, Jim Mayer wrote a book *Shackleton, A Life in Poetry* where he notes, “For Shackleton, poetry was ‘vital mental medicine' throughout his life. Shackleton, who did more than any other explorer to open Antarctica to the popular imagination, used poetry as a tool, to encourage and motivate men who were frequently operating close to their physical and psychological limits.”

It was pleasing to note that poetry is alive and well in Antarctica. Bill Manhire's poem 'Erebus Voices' was read by Ed Hillary at the 25th anniversary memorial service at Scott Base, and is now a classic. Victor Billot helps us to look to the future with his poem 'Nix Terra'.

Botanist Joseph Hooker and second master of HMS Terror, J.E. Davis, made the first water colour paintings of Erebus in 1841. In 1901-04 on Scott's first expedition, Edward Wilson did some delightful landscape paintings including Erebus.

From a conservative painter such as Maurice Conly, the man who designed our NZ one and two dollar coins, to the rather odd but likeable painting by Yasoda Dulal influenced by Buddhist art in giving his interpretation of the volcano's inner workings, there is a real smorgasbord of 22 paintings of contrasting styles. All are beautifully reproduced and the text artistically crafted. It is worth buying the book for this chapter alone.

As a final note, artist Jason O'Hara *Where Memories Sleep*, sees Erebus as a powerful kuia and kaitiaki—an elder, a guardian and a protector. Having read this book, which collates homages to Erebus, I think he is correct.

Reviewed by **Bob McKerrow,** NZAS

Book Review

Artists in Antarctica

edited by Patrick Shepherd

Massey University Press 2023. ISBN 978-1-9910-16-27-0

A gorgeous new volume exploring what Antarctica evokes, as shared by artists, writers, even jewellers, dancers and fashion designers: a fine addition to any Antarctic library

ANYONE who's been to Antarctica can attest it often stirs a swirling storm of feelings and emotions. There's the surface level: the cold; the ice; the white; the remoteness. But there's far more burbling inside—difficult to describe, even harder to convey in ways others can begin to understand, especially those who haven't been.

University of Canterbury senior lecturer Dr. Patrick Shepherd's new book, published 9 November, 2023, features New Zealand artists who have visited Antarctica to convey their impressions beyond words. Shepherd, who visited Antarctica in 2004 and again in 2016/2017, is himself a creative figure who wrote Antarctic compositions such as *Cryosphere*, *Katabatic* and *Fanfare for a Frozen Land* (all 2005). All of the featured artists went as part of Antarctica New Zealand's various programmes to support artists to document and delve into the impact the continent can have on a person, and the impact people are having on Antarctica. Shepherd also discusses his time in Antarctica and how it impacted him creatively. Art, he writes, is also part of the Antarctic story.

The book includes a foreword by Antarctica New Zealand CEO Sarah Williamson and an essay by Antarctic arts researcher Dr Adele Jackson, which discusses in some detail Aotearoa New Zealand's Antarctic arts and cultural heritage.

The 240-page book is a work of art in itself—every page is filled with stunning photos, drawings, paintings, or poems. Each of the 37 artists and writers—their contributions displayed in alphabetical order by their last name—tells a bit about their Antarctic experiences, and some of their work that resulted from being there is showcased. The poet Bill Manhire—featured in *Antarctic* June 2023—reflects on the rhyming poems he wrote out in the field in January 1998 which helped him "stand up straight" amid Antarctica's deep, existential challenges.

Aside from its design, a real strength of this coffee table style tome—with thick, tactile paper stock for each page and a beefy spine—is the diversity of creativity included. Corey Baker, for instance, is a choreographer, who went to Antarctica in 2017/2018. Stills are shared from *Antarctica: The First Dance*, created by Baker, filmed on the ice, and performed by Royal New Zealand Ballet soloist Madeleine Graham. Fieke Numan is a fashion and wearable arts designer. She shares how her time on the ice and the science she witnessed in November 2002—such as a biopsy on a seal—has influenced the clothes she designed for a show at the Hocken Library, Dunedin and a collection *Antarctic Heroines* based on the Heroic Age of Exploration for the 2003 iD Dunedin Fashion Show.

As an addition to the literature published about the Antarctic expeditions, history, landscapes and wildlife, this book feels fresh in covering Antarctic creative expression. It's an inspiring publication.

Reviewed by **Ben Mack,** NZAS journalist

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- Antarctica New Zealand
- International Antarctic Centre

ABOUT THE BACK COVER

The back cover image features the Scott Base Pouwhenua which is also shown on the new issue postage stamp at the top right.

Unveiled in January 2013, the Scott Base sign and pouwhenua were created by Ngāi Tahu carvers. The pouwhenua, Te Kaiwhakatere o Te Raki, looks to the sky for celestial navigation and represents exploration, discovery and the importance of the environment. While Scott Base around them will change, these taonga and the TAE Hut will remain.

2023 ROSS DEPENDENCY-SCOTT BASE STAMPS

NZPO have recently issued a set of 4 stamps and covers to commemorate the passing of the old base with the planned refurbishment of Scott Base, New Zealand's home on Ross Island, Antarctica. The photographer is Anthony Powell a member of NZAS. See his stunning centrefold.

Become a member of the **New Zealand Antarctic Society**

antarcticsociety.org.nz

Established in 1933, the New Zealand Antarctic Society brings together people interested in Antarctica to share their knowledge with others, foster interest in the region, and support the protection of the Antarctic environment.

Anyone can join!

Sign up online at:
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Or contact:
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Members can:

- Receive the biannual *Antarctic* magazine
- Receive monthly email *RadioSked* updates
- Be informed on the history and the latest science
- Access online archives and resources
- Attend events
- Ask a scientist
- Connect with Antarctic veterans
- Engage in the protection of Antarctica
- Spread awareness of Antarctica's climate role

AN INVITATION TO SUPPORT THE ANTARCTIC SOCIETY WITH A GIFT:

Fill out this form, scan and email to Treasurer@antarcticsociety.org.nz or post to the address below

Gifting and/or Bequest Form

I give, bequest and bequeath to the NZ Antarctic Society, a not-for-profit organisation (NZ Charities #CC27118), the sum of

$ _____ to be used in the following manner *(tick those that apply):*

		%
☐	The NZ Antarctic Society Endowment Fund, with the capital protected and the proceeds from investments to be used for development of the organisation.	
☐	Identifiable strategic initiatives clearly stated in the Society's strategic plan, and this contribution will be recognised accordingly.	
☐	Oral Histories – collecting and storing the memories and anecdotes of previous NZ Antarcticans, and personnel within the NZ Antarctic Society.	
☐	The operating costs of the Society to ensure the financial sustainability of the organisation.	
☐	Activities at the discretion of the Society's Executive.	

Name: Signed: Date:

If this is a gift, please place your gift in our BNZ account 02-0800-0685108-02, using your name as reference, and send this form to The Treasurer, NZ Antarctic Society, International Antarctic Centre, Private Bag 4745, Christchurch 8140. If this is a bequest, please pass a copy to your lawyer for your will and send a copy to NZAS Treasurer. Thank you for your support.

Scott Base Pouwhenua.
The pouwhenua is one of the images on the
2023 Ross Dependency postage stamps (top right)

Images by Anthony Powell