ANTARCTIC

The Journal of the New Zealand Antarctic Society Vol 18, No. 3 & 4, 2001

Special Double Issue

- US Programme Overview
- Scott Base Reconstruction
- April Rescue Missions
- Lake Vostok
- Space Mapping

ANTARCTIC

COVER PICTURE

Bassler ski-equipped DC3 of World Logistics deploys a University of Canterbury geological field party in the Rennick Glacier, northern Victoria Land, November 2000. Photograph: John Bradshaw

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Call for articles

We invite readers to submit articles for *Over My Shoulder,* a series relating to past experiences in Antarctica. The aim is to record memories in print so that they are not lost to the future. Contributions from any country will be accepted.

Topical discussions on Antarctic themes are also welcome.

Please send to: The Editor, New Zealand Antarctic Society, C/o PO Box 404, Christchurch, New Zealand.

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Daring Rescues Cheat Winter

HERCULES AND TWIN OTTER PILOTS MADE ICE HISTORY

Every once in a while, human endeavour reminds us that, like space exploration, Antarctica is one of the most challenging frontiers.

Accustomed to the regular commuting of aircraft to the continent, which occurs in the summer season as a virtual airline service, the public have become increasingly blasé about the enormous risks associated with Antarctic transportation. Just as the space shuttles of NASA are launched on almost routine schedules, the long flights south and back have largely faded into folklore.

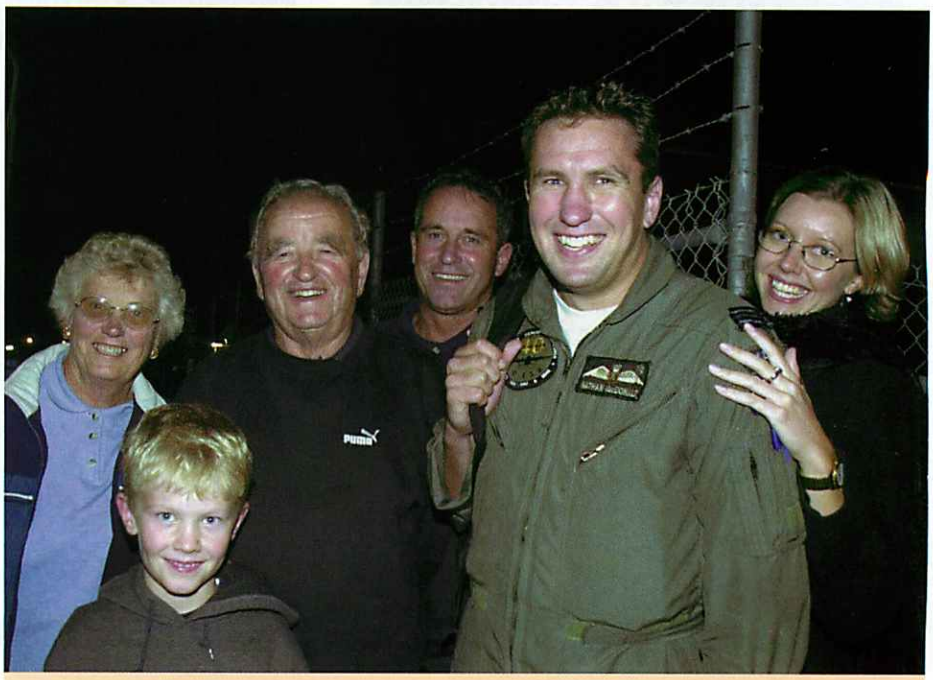
Well almost...just as a billionaire can return the focus of mankind to space, so too can an event tinged with human drama and emotion emerge from the Ice to claim back the front pages of newspapers around the planet. In that way great drama is compressed into how millions of human beings feel about the plight of another. It is the way modern media work.

So it was that two human dramas coincided in the final days of summer 2000-01 to seize attention to Antarctica, both involving emergency flights to the continent to uplift ill people.

On 24 April 2001 a Royal New Zealand Air Force Hercules aircraft evacuated 11 Americans, five ill, from McMurdo Station. The RNZAF undertook the mission at the request of the Antarctica New Zealand, which works co-operatively with the US Antarctic program to pool flights during the normal Antarctic summer. Two Americans were in a stable medical condition at Christchurch Hospital, New Zealand, after the flight and three others suffered minor health ailments. Because there was an aircraft with space available, a number of other United States staff that were scheduled to stay in the Antarctica for the winter left McMurdo for "a variety of reasons" including non-emergency medical problems. Details of the illnesses were unavailable from Raytheon Polar Services which provides services to the US Antarctic Program but media sources indicated that one of the men in hospital had a serious heart condition and another had injuries from a fall. Some of the others had family emergencies or personal reasons including industrial relations issues behind their evacuation.

The aircraft, stationed at Whenuapi field in Auckland flew to Christchurch, the regular departure point for the Ice.

The New Zealand aircraft carried two aircrews for the long flight South and back, a small maintenance crew and two medical personnel – a total of 15 people.



Christchurch pilot Flight Lieutenant Nathan MacDonald's family welcome him home from the McMurdo rescue mission. From left to right: grandparents Helen and Bill Watson, cousin Simon Watson (front), uncle Graham Watson and Nathan's girlfiend Sophie Lee. Photo: David Alexander, The Press.

Cartoon courtesy "The Press."

Physician Dr Ronald Shemenski arrives in Chile after a dangerous rescue from the South Pole. Photo: Reuters.

A RNZAF Hercules flew on a 15 hour 6000km flight with only half an hour of daylight available to land at McMurdo Station. Photo: Paul Harrison, RNZAF Public Relations.

The New Zealand manager for Raytheon, John Sherve, praised the Hercules crew for their heroic effort in making a 15-hour 6000km flight from Christchurch to McMurdo and back late in the twilight zone of the year. "The mission was very well handled and very successful. We cannot thank the RNZAF enough."

Hercules pilot Flight Lieutenant Nathan MacDonald reported weather conditions at McMurdo as "a bit iffy" as the aircraft approached the continent with less light than normal.

"There was no defined horizon and it was hard to see the ground surface," he said. "It was reasonably challenging weather conditions."

The Hercules spent an hour on the ground at McMurdo, which is 1300km from the South Pole, to pick up the evacuees and refuel. The flight was the first ever undertaken to the Ice by the RNZAF as late as April, with winter closing in and leaving just 30 minutes of visible sunlight and a six hour window of dusk light for landing and departure. The RNZAF has flown to the Antarctic in August, which has similar weather and daylight conditions to April.

Antarctica New Zealand communications manager Vivienne Allan says the lack of light had made the mission particularly dangerous. Antarctica was only days away from the moment when the sun dips below the horizon for the four month period of total winter darkness.

The first leg of the flight should have taken 7 1/2 hours but a head wind added an hour. On landing the engines of the aircraft were kept running to prevent them freezing in the –30deg C temperatures. "We just missed the peak of daylight but there was enough light left to get the job done," says mission commander John Cummings. "There was a reasonably low cloud base and diffuse light."

Another medical drama was being played, almost simultaneously, out at the South Pole itself, where an American doctor Ronald Shemenski, 59, had suffered a gall bladder attack and had been diagnosed as having potentially life-threatening pancreatis, an inflammation of the pancreas. The US authorities feared he could suffer another setback during the long winter months that were approaching.

The issue then became whether an aircraft could land and evacuate him safely.

Dr Shemenski expressed his willingness to winter over and "suffer whatever consequences might occur", but the National Science Foundation, which operates the Amundsen-Scott South Pole Station, where Dr Shemenski was working, became 'deeply concerned' about his problem and put together a rescue plan. The degree of difficulty in rescuing Dr Shemenski were described as "extreme' as the last plane for the summer had left the South Pole on 15 February two months earlier and the sun had set for the last time for the season on 15 March. Temperatures had fallen into the range that made any attempt to land an aircraft extremely dangerous, at –63deg Celsius and with wind chill –72deg.

Initially a plan to use one of the world's only ski-equipped LC-130 Hercules aircraft, operated by the 109th Airlift Wing of the New York Air National Guard was contemplated but reportedly the planes were turned back on arrival at Hawaii when it was decided to use a smaller aircraft for the mission.

Two eight-seater Twin Otter aircraft were chartered from a private

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Khlebnikov reaches shipping's deepest point south

On 11 January 2001, the Russian icebreaker *Kapitan Khlebnikov* broke the most southerly shipping record by reaching latitude 78° 37′ S in the southeastern Ross Sea.

The *Khlebnikov*, charted by Quark Expeditions, was on the second of it's three voyages this season to the Ross Sea and achieved the record by entering the Bay of Whales at longitude 162° 02′E and landing passengers.

Before this season the record had stood at 78° 30′S. Ships that dock adjacent to the McMurdo Station reach only 77° 50′S. The larger 'indent' of the Bay of Whales resulted from the massive ice-edge calving event that occurred in March 2000.

Satellite photographs show that a 30 km wide zone of the Ross Ice Shelf had broken away along 250 km of its edge to form the massive B15 iceberg. Since its formation, this iceberg has broken into at least seven smaller fragments (B15 A to B15F), all of which are being tracked by the US National Ice Centre (NIC).

The *Khlebnikov*'s Master, Peter Golikov, reported that it took his ship seven hours to travel the length of B15A, the largest of the remaining fragments. The National Ice Centre estimates from satellite imagery that the size of B15A is 140 km by 30 km.

The Bay of Whales was the wintering site of Roald Amundsen's Norwegian expedition and its departure point for their successful journey to the South Pole. The bay owes its origin to a local topographic high below the Ross Ice Shelf immediately to the south of the bay. The high creates doming of the ice to form Roosevelt Island, and this in turn affects the dynamics of the Ross Ice Shelf along its margin.

The Kapitan Khlebnikov *on Weddell Sea pack ice. Photo courtesy Colin Monteath from his book "Antarctica - Beyond the Southern Ocean".*

Thirty five make traverses to Pole

Of the five private "Across Antarctica" expeditions that were originally planned for this season, only one was completely successful. Eirik Sønneland and Rolf Bae of the Norwegian Antarctic Expedition were the only traversers to complete the course (see *Antarctic* vol. 18 no. 2, p. 43). The two-woman Bancroft Arneson Expedition (Ann Bancroft US, Liv Arneson, Norway) traversed as far as the Ross Ice Shelf but ran out of time and had to give up to avoid missing a ship to transport them from Antarctica (vol. 18 no 2, p. 29).

Stane Klemenc (Slovenia) a solo skier who hoped to make the crossing using a unique chair-parasail combination, was forced to abort his planned traverse from 'Blue 1" in Dronning Maud Land at the end of November due to a leg injury. Pulling the weight of the sledge and parasail system (200 kg) up towards the Plateau may have contributed to his injury, which kept him tent bound for at least two days. Poor communications with "Blue 1" due to solar activity and "spoiling" of some of Klemenc's food did nothing to help the situation, and the lone skier returned to "Blue 1" and onto South Africa early December. Klemenc is an experienced climber who has the fastest climb of Mount Vinson to his credit.

Two other major traverses, the "Canadian Antarctic Millennium Expedition" and the two woman "Trans-Antarctic Expedition" (see Antarctica vol. 18 no 1, p. 77) were forced to cancel due to lack of funds.

Eight private groups planned traverses to the Geographic South Pole this season but only six completed the course. "Alone Expedition" and the "Trinity Expedition were cancelled.

The first group to arrive at the South Pole, on 28 December, was the Sasquatch Expedition (Marc Cornelissen and Wilco van Rooijen) after a 48 day trek from Patriot Hills. The pair had been flown into the Patriot Hills 9 November to begin a 2200 km unsupported return journey to and from the South Pole. For the first few days the two men experienced difficulty pulling their 165 kg sledges and were forced to depot some of their load and to modify their sledge runners. After that things improved, and the pair completed their journey in 66 days, taking only two weeks for the journey back to the Patriot Hills.

On the 31 December nine members of the "Pole to Pole 2000" Expedition arrived at the Pole after skiing 220 km in 13 days from latitude 88° S. The group comprised leader Martyn Williams and Dylan Spencer (Canada), Jay Choi (South Korea), Devlin Fogg (South Africa), Jessica Casas and Heidi Hausman (US), Mercedes Rosauer (Argentina), Naoki Ishikawa (Japan) and Renaurd Richard (France). Four of the group had intended to ski back to the Patriot Hills but this part of the plan was abandoned.

Gregers Gjersoe and Kristian Joos of the Danish "South Pole Expedition 2000" reached the South Pole 12 January after making a 1100 km unsupported manhauling traverse from Hercules Inlet on the Ronne Ice shelf. They initially had a poor start on 19 November due to bad weather.

Bad weather and a late start also affected the eight-person "Last Degree" group. They began their 115 km ski trek to the Pole from Latitude 89° on 31 December after being flown in from Patriot Hills. The leader of the group, Laurie Dexter, had originally planned to cross Antarctica this season with compatriot Scott Smith as the "Canadian Antarctic Millennium Expedition", but this failed due to lack of funding. Also part of the "Last Degree" group was Australian Brigitte Muir who plans her own traverse in 2001-02.

The "Challenging Horizons: a Blind Man's Journey to the Edges of the World" group comprised UK blind adventurer Miles Hilton-Barber, his companion Jon Cook, and ANI Guides Doug Stoup and Damien Gildea. The group arrived at Patriot Hills 18 No-

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The Spirit of Sydney, *which suffered damage from pack ice off the coast of Adelie Land.*

Ice damage to yacht

The 19 metre yacht *Spirit of Sydney* suffered damage to its hull, steering system and propeller when it became caught in pack ice for several days off the coast of Adelie Land in late January. The yacht had left Hobart on 11 January on its eighth voyage to Commonwealth Bay in the last six years with a crew of ten people, eight of them paying for the opportunity of crewing on the ship.

Bad weather for the first part of the voyage made the ship five days later than usual, and then it took four days to penetrate 80 km of dense pack ice (9/10ths concentration) before reaching open water near Commonwealth Bay. After a very short stay at the bay where no landings were attempted the yacht attempted to re-cross the pack ice belt but soon became beset. Ice pressure caused leaks in the ten millimetre thick aluminium hull and measures were taken to prepare the ship for a rapid evacuation.

The Australian Search and Rescue Centre (AusSAR) in Canberra asked the French national programme vessel *L'Astrolabe*, only two days away on a voyage between Hobart and

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Bad weather hard on tour ships

Rough seas soon after the *Kapitan Khlebnikov* left Bluff, New Zealand, on its final voyage of the season left a passenger with a suspected fractured skull after he struck a mirror in his cabin. The cut was stitched by the doctor on board, but was reopened after heavy bleeding. The vessel turned back towards New Zealand and met with a helicopter eight miles south of Stewart Island, where the injured man and his wife were lifted off and taken to Invercargill Hospital. A scan showed that the injury was not as serious as at first thought.

On the other side of the continent, 950 km northwest of South Georgia, the *Bremen* was on its second and final voyage of the season. On 22 February it met strong winds and nine to 14 metre high waves. One of these waves smashed the windows of the bridge, normally 12 metres above sea level.

Although no one was injured, the strength of the wave and the large volume of water that entered the bridge left the vessel without steerage or control of its engines for almost two hours. Radar, navigation lights, gyrocompass, echo sounder and primary VHF line of sight radio were non-functional, causing an automatic 'mayday' call to be transmitted.

The *Bremen*, owned by the Hapag Lloyd Company, was carrying 137 passengers at the time and was on its way from South Georgia to Rio de Janeiro. Because of the damage and the rough seas, the ship was diverted to Buenos Aires where passengers were disembarked and where repairs could be made. Repairs were completed by 2 March and the ship left to resume tour operations in Brazil.

The *Bremen*, formerly the *Frontier Spirit*, has been operating in Antarctic waters since 1989, but this year did not prove to be an easy one. On it's earlier voyage of the season on a circumnavigation of Antarctica from New Zealand, the ship was unable to enter the Ross Sea due to very dense pack near the Balleny Islands. The proposed visit to Ross Island and the historic huts had to be cancelled.

A similar storm hit the Linblad Expedition's tour ship *Caledonian Star* on 2 March south-west of the Falkland Islands with winds up to 100 knots. There was extensive water damage when a large wave broke windows, but the ship was never out of control.

Caledonian Star was originally built as a factory fishing trawler for Greenland waters. Despite being capable of handling rough seas well, it was forced to head into the sea for most of the day to ride out the Antarctic storm. An 'enormous wave' struck the ship in the late afternoon, damaging the starboard bridge wing before breaking four of the windows on the bridge.

One passenger is reported to have fallen and dislocated a shoulder during the storm, otherwise, apart from a minor sprain, there were no injuries. None of the injuries are believed to have been the direct result of the wave that struck the bridge.

"Mission Antarctica" death

A crewmember on the 22 metre yacht *2041* collapsed during the crossing of the Drake Passage on 25 January 2001 en route to King George Island. Despite the efforts of the eleven others on board and medical advice by satellite, the 26 year old woman, Phillipa Gregory, died from unknown causes.

A distress call from the yacht was answered by the British Naval ship *Endurance* who removed Ms Gregory's body to Bellingshausen Station, from where it was flown to the Falkland Islands the following day.

The remaining passengers, all members of the Royal and Sun Alliance Insurance Company, a major sponsor of the mission, were flown from Marsh Station to Punta Arenas, Chile, and are believed to have returned home to Australia, Canada, Colombia and Ireland.

It was the second voyage of *2041* for "Mission Antarctica", whose project has been to assist the Russian Government to remove and recycle some 1000 tonnes of rubbish from Bellingshausen Station. Unfortunately it was also the second mishap of the season. Another passenger had to be evacuated by air in early December 2000 after dislocating his elbow in a fall.

'Ice Damage to Yacht'

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Dumont d'Urville station, if it would assist the yacht. The AusSAR also placed a Royal Australian Air Force (RAAF) Hercules on standby in case an airdrop of emergency equipment was needed.

However, the yacht was released from the ice a few days later and managed to manoeuvre its way north, making as many temporary repairs as possible. It rendezvoused with *L'Astrolabe* on 31 January. The sea worthiness of the yacht was assessed and declared safe, and requests from several concerned members from the yacht to be taken on board the French ship were declined.

The yacht finally made it back to Hobart on 21 February after a slow three-week voyage across the Southern Ocean, using sail power. On arrival skipper Chris Roberts was quoted by a Hobart newspaper as saying that he and his nine companions "had an argument with nature" and that they were "very, very, very lucky".

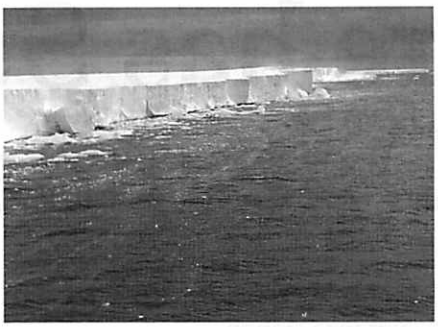
The *Spirit of Sydney* is owned and operated by the Ocean Frontiers Company, an Australian Yachting Federation Endorsed Training Establishment that provides adventure sailing voyages.

What's Eating Antarctica?

In March 2000, an 11,000-square-kilometre iceberg the size of Connecticut (B15) split from the Ross Ice Shelf in Antarctica. Two months later, a similar area of ice broke free from the continent's Ronne Ice Shelf. Three months after that, the Ninnis Glacier Tongue, a 1,450 sq.-km slab of ice jutting into the sea, snapped off near the shoreline and cast off for warmer climes.

Last September, yet another huge chunk of ancient ice broke free from the Ross Ice Shelf. Now, satellites have detected a crack across the Antarctic ice shelf that's fed by the Pine Island Glacier. This massive fissure promises to spawn another megaberg in the next 12 to 18 months.

Scientists are asking what's behind this sudden mass exodus. Each Antarctic ice shelf typically sheds a super-size iceberg only once every few decades. Global warming might seem like the most likely explanation, but researchers have been unable to directly link warming to the rapid-fire shedding from the continent's southernmost ice shelves. In fact, scientists argue, the ice shelves were overdue to unload these huge burdens.



One of the giant Ross Shelf icebergs near Cape Crozier, January 2001 Photograph Margaret Bradshaw.

Antarctic icebergs are a breed apart from their Arctic brethren. Most large icebergs in the Northern Hemisphere calve from glaciers that flow into the ocean along the coasts of Alaska and Greenland. Smaller chunks come from the breakup of ice that forms on the ocean every winter

In contrast, large southern bergs, which often cover hundreds of square kilometres, periodically split off from ancient ice shelves that float atop the frigid southern seas. Nourished by the languid flow of solid kilometres-thick ice sheets overlying the continent, some of these ice shelves are hundreds of metres thick and cover shallow coastal regions the size of Texas or larger.

Although the Arctic Ocean doesn't have such perennial ice shelves these days, there are hints of their earlier presence. Scientists recently reported huge scrapes and gouges on deep undersea sediments there, which suggest that kilometre-thick ice shelves graced the Arctic seas during some previous ice ages

North or south, massive changes in the icescape normally happen slowly. Last year's Antarctic émigrés seem to be following a new set of rules, however. They were cast away in quick succession, as if the conti-

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Thirty five make traverses to Pole

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vember and was flown to Hercules Inlet to begin the 1100 km traverse on 20 November. One month later Hilton-Barber was forced to abandon his attempt when he got frost bitten hands. Although not serious, the fact that he was so reliant on his hands was a key factor in his decision to leave the group. The three remaining members continued to the Pole arriving 20 January after a journey of 62 days, and on the same day as ANI's "Ski South Pole" commercial group.

The "Alone Expedition", organised by the California company Xstreme Climb, was an attempt by Doug Stroup to ride a specially designed bicycle to the South Geographic Pole from the Patriot Hills after he had completed his part as a guide with the "Challenging Horizons" trip in January. Stroup has the distinction of having descended the Vinson Massif on a snowboard in November 2000. The late arrival of the "Challenging Horizons" team at the Pole left Stroup with insufficient time for his second venture, and the "Alone Expedition" was postponed.

The British / American couple Thomas and Tina Sjorgen of "The Pole Wearables Expedition 2000-01", left Hercules Inlet in Ellsworth Land on 19 November at the start of an unsupported, 1100 km traverse to the South Geographic Pole. They planned to complete a similar journey across the Arctic Ocean to the North Geographic Pole by early May 2002. One of the aims of the Expedition was to test a new, light-weight, 'wearable' communications system that had been designed to provide "unlimited global communications" for small mobile parties operating in remote areas, including the polar regions. In addition to the hardware, which consists of a head-mounted eye piece, a small computer worn on the waist and a 'mouse' attached to a finger, the prototype also contains new software designed to allow the transmission of images via the Orbcomm text-message satellite system.

Each Orbcomm message is limited to a maximum of 200 characters and the Sjorgens say that their software divides each image into individual text-message packages, which after passing through the satellite system are reassembled at the receiving point using related software. Tests of the system and software appear to have worked successfully in Venezuela and from Mount Everest Base Camp, although some trials conducted in Arctic regions have been unsuccessful. An image from Hercules Inlet was successfully transmitted via Orbcomm before the pair's departure.

The party made slow progress and took six weeks to reach the halfway mark. Thomas was reported as having a non-life threatening illness that was slowing the pair. The Sjorgen's were forced to abort the traverse on 21 January when they were picked up by an ANI aircraft still 260km from the Pole, and only a short time before Adventure Network International operations closed down for the season.

Modern Antarctic Kayak Adventure has Successful Outcome

Who said there were no modern Antarctic heroes? This year has seen the emergence of several, including the participants of Antarctica's first major kayak adventure.

On 19 February 2001 three New Zealand friends, Graham Charles, 34, Marcus Waters, 35, and Mark Jones, 37, all experienced kayakers and climbers, successfully completed a 700 km self-supported kayaking journey down the western side of the Antarctic Peninsula.

"The Antarctic Peninsula Sea Kayaking Expedition" was organised by the non-profit organisation "Adventure Philosophy". The expedition was seen as a flag bearer for 21st-century adventure and aimed to show today's youth that modern adventuring was still possible in a world where major challenges are becoming fewer and fewer.

Graham Charles is one of New Zealand's top kayakers, a veteran of three world championships, an Antarctic field instructor at Scott Base in 1998-99 and author of "Bible of New Zealand whitewater destinations". Marcus Waters grew up at Outward Bound in Marlborough where his father, Ray Waters, an "Old Antarctic Explorer", had been Deputy Warden. Marcus had been friends with Graham since childhood, and was involved a few years ago in Antarctic fieldwork with the New Zealand programme. Mark Jones had spent his life tutoring in outdoors education and was in charge of Outdoor Recreation Programme at the Auckland University of Technology. All three men had worked for some years at the Sir Edmund Hillary Outdoor Pursuits Centre in Turangi.

On 16 January 2001 the three kayakers were landed at Hope Bay, at the northern end of the Antarctic Peninsula, by Sir Peter Blake's schooner *Seamaster*. After landing they made a short visit to Argentina's Esperanza station.

Storage space in the kayaks was limited, a mere single cubic metre in the three craft combined, which had to accommodate camping gear, clothing and food, leaving little in reserve. As they followed the coast southward during the next week, the party found the long exposed sections of the route 'nerve wracking', with frequent weather changes that included snow and high winds. Some days were as long as fourteen hours. The boats performed well, but the three layers of kevlar in their bows was "taking a hammering in the ice".

At Gourdin Island they were forced to wait a day for sea ice to move out of the bay in which they were camped. They visited the Chilean station Bernado O'Higgins. At Duparc Rocks they were lucky to make a safe landing in a large swell, and they met surfing conditions in Lancaster Bay.

The half-way point of the journey had been passed by the time they reached Sprightly Island in Hughes Bay on the evening of 29 January, after pushing through five km of heavy brash ice to reach the Island, where the ship *Tooluka* had earlier established a food depot.

After leaving Cuverville Island, where conditions were good enough for a swim, the three men paddled down the Errera Chanel and through Andvord Bay before camping at Waterboat Point. From there they travelled around Paradise Bay and across Gerlache strait to camp overnight on Truant Island just south of Wiencke Island. They visited Port Lockroy on 1 February and then spent two days passing through the Lemaire Channel and visiting Peterman Island. The three kayakers were welcomed for an overnight stay at the the Ukranian station Vernadsky on 4 February.

The next part of the journey was the 160 km to the Antarctic Circle and Adelaide Island. The team reported "some good drama", which included "difficult landings" in surf and the need to repair one of the boats. There was also the near swamping of one of their overnight camps by a large wave from the collapse of an iceberg, and some "very long, exposed crossings" during which they were concerned that katabatic winds would "whisk" them out to sea.

The longest, seventeen hour day occurred after they crossed the Antarctic Circle on 18 February, when they pushed on with a 90 km overnight paddle to the end of their journey at Adelaide Island. It was "very cold" that night and the kayakers were "totally encased in ice except [for their] arms where the movement kept the ice from forming". Up to a centimetre of ice built up on the kayaks, and progress was slow as the sea was starting to freeze and they were paddling through grease ice.

After their arrival at Adelaide Island the three men made contact with the tour ship *Explorer*, which was able to forward a report to their headquarters in New Zealand, thereby breaking a two-week silence on their whereabouts. *Explorer* offered to carry the men and their boats 300 km north to Port Lockroy, arriving 21 February. This transport was important as their pickup ship, the *Tooluka*, had been delayed by bad weather in Drake Passage and could now pick them up from Port Lockroy rather than Adelaide Island. On board the *Tooluka* was a film crew to make a documentary on the trio's adventures for television. *Tooluka* arrived back in Ushuaia, Argentina, in early March 2001.

Dangerous Rock Conditions Force Revision of Holtanna Peak Climb

Dangerous rock conditions on the northern summit of Holtanna Peak forced the Queen Maud Land International Expedition (QMLIE) to revise its planned climbing programme late last month (see *Antarctic* Vol. 18 no 1, p. 5). The climbers did, however, successfully reach Holtanna's southern summit late on 31 December.

The plan had been to climb the sheer walls of Holtanna's northern peak, then to cross the intervening rock ridge and descend after climbing the southern peak

As soon as the group had established their 11-man base camp a kilometre from the mountain, six climbers began an attempt on the northern summit on 18 December. They took with them four portaledges on which they would camp, each a platform a few metres square that hung from the cliff face. Ice had to be carried from the bottom of the climb for water.

Within a few days it became obvious that the rock on the sheer 800 m high wall was rotten and that it was too dangerous to continue upwards. The climbers were able to negotiate a candle of rock adjacent to the northern face that was half as high as the main face. Due to the conditions on the main face, climbing aids that had been fixed to the rock, together with a 'few hundred metres' of climbing rope, were left behind on its lower reaches.

The party then decided to climb Holtanna's southern peak which had better rock, following the same route used by a Norwegian group seven years ago. The climb took about five days and involved a number of bivouacs. The ascent was described as very difficult in a number of places, but all six climbers reached the southern summit.

During the first two weeks of the New Year the expedition spent time 'picking off as many virgin summits in the area as possible'. The group also made several parasail-assisted journeys for filming, and looked for meteorites in nearby blue ice areas. Three members of the QMLIE left Antarctica on a 'Polar Logistics' flight on 8 February from 'Blue 1' to Cape Town, South Africa, but at that date there were still eight remaining members in the Orvin Mountains area. The eight are believed to have travelled to the South African SANAE Base, then to the German Georg von Nuemeyer Base, where they boarded the icebreaker *Polarstern* for passage to Punta Arenas, Chile.

'Heatwave' Stresses Penguins

French scientists have warned that penguins in the Antarctic could be very susceptible to changes in climate and could be threatened by any long-term temperature shifts.

The researchers made their remarks after observing a dramatic decline in the population of one bird colony, which coincided with an abnormal warm period in the Southern Ocean in the 1970s.

The penguin numbers at Dumont d'Urville Station in Terre Adelie were found to have dropped abruptly by 50% when the average winter temperatures in the area rose from minus 17.3°C to minus 14.7°C.

However, British researchers cautioned against jumping to conclusions about any global warming and insisted that overall penguin numbers in the Antarctic were healthy.

Egg hatching

The temperature increase in Terre Adelie, which lasted into the early 1980s, raised sea-surface temperatures and reduced the extent of local sea ice.

Reduced sea ice is associated with a lower abundance of krill, the small shrimps that are a key element of a penguin's diet along with fish and squid.

Christophe Barbraud and Henri Wirmerskirch, from the Centre d'Etudes Biologiques de Chize, in Villiers en Bois, wrote of their findings in the journal *Nature*: "In years with high SSTs (sea surface temperatures) emperor penguins probably have difficulties in finding food, which could increase mortality."

Paradoxically, extensive winter pack ice reduced egg-hatching success by increasing the distance between the hatching areas and the hunting grounds, the scientists found. This meant that the penguin population faced a trade-off between finding enough food to survive and laying enough eggs to sustain the colony.

Computer models

The researchers report that penguin numbers at Terre Adelie have now stabilised. However, they write in *Nature:* "Our results... indicate that

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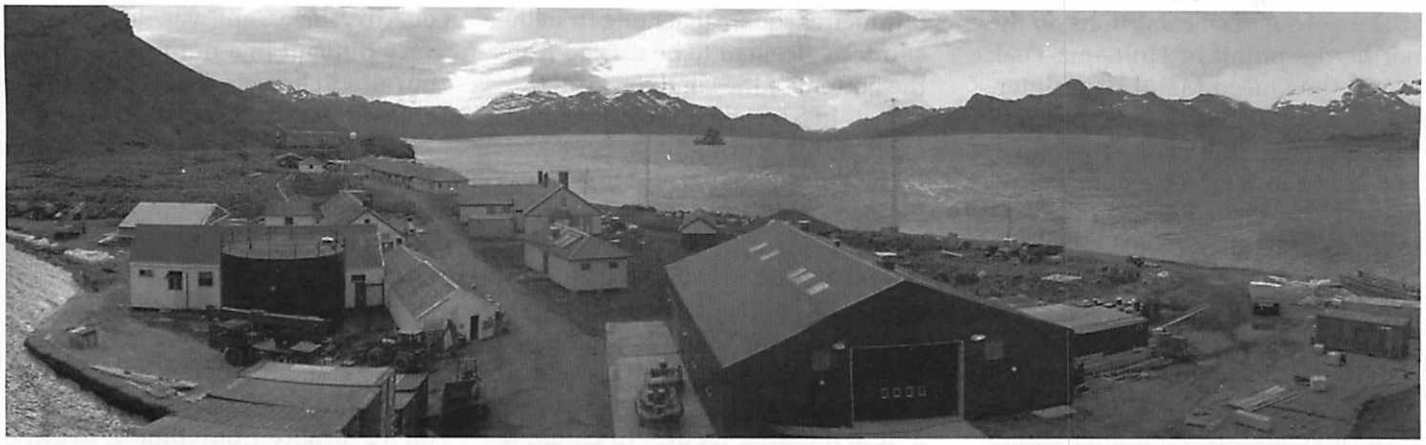
New Fisheries Research Station on South Georgia



Panoramic view of King Edward Point, South Georgia.

The new Applied Fisheries Laboratory at King Edward Point, South Georgia was officially inaugurated at a ceremony on 22 March 2001 by the Commissioner for South Georgia and the South Sandwich Islands, His Excellency Donald Lamont. Amongst those present were the Director of the British Antarctic Survey, Professor Chris Rapley, Commander of British Forces in the Falkland Islands, Air Commodore John Cliffe, and Dr Inigo Everson (BAS Marine Biologist after whom the accommodation block was named) together with military personnel, media representatives, and staff and contractors of the British Antarctic Survey.

The ceremonies included the naming of the James Cook Laboratory and Everson House, numerous speeches, a lunch with champagne air-dropped into Cumberland Bay and brought ashore by rigid raider, a service at the old whaling church in Grytviken, and the laying of wreaths on the graves of Sir Ernest Shackleton and a young Argentine sailor who was killed during the retaking of South Georgia in 1982. It was an event for the history books, coinciding as it did with the relocation of the military garrison to the Falkland Islands after nineteen years at King Edward Point. BAS now has the responsibility to maintain the UK presence in South Georgia.

The project to design, transport and build the new facilities were a race against time, given early delays and the worst summer weather at King Edward Point for years.

On the occasion of the inauguration, Baroness Scotland, the Foreign Office Parliamentary Under Secretary of State, wrote officially: "The occupation of these facilities will mark BAS' return to a permanent presence on the island, and heralds a new phase in the administration of South Georgia. I am sure that the Survey's research into the biology and ecology of the various fish species around South Georgia will bring considerable benefits to the development of long-term sustainable fisheries in the region, and benefit the UK's input to the Antarctic Fisheries Commission (CCAMLR). The establishment of new facilities on South Georgia will augment BAS' existing role in providing a first class programme of science in the Antarctic. This reaffirms Government policy that BAS should be the primary means through which the UK can continue to maintain its presence and profile in Antarctica".

Fourth Antarctic Marathon run at sea

The 4th Antarctic Marathon and half marathon planned for King George Island in the south Shetlands were both thwarted by bad weather in early February this year.

The event was organised by the US based Marathon Tours, who carried 108 runners aboard the *Lyubov Orlova*. Routes were marked on 2 February in gale force winds that persisted for three days. The weather was considered too dangerous for the runners to disembark and the ship headed south down the Antarctic Peninsula.

If all had gone to plan, the races would have started and finished at the Uruguayan station Artigas and passed through Russian (Bellinghausen), Chilean (Presedentie Eduardo Frei), and Chinese (Great Wall) facilities. Staff from the stations were to operate way points on the courses, provide water, medical assistance and 'supportive cheers' to participants, while some would also have taken part in the events.

Determined not to disappoint, the company decided to run the marathon on board the ship. The half marathon was run on 6 February and the 16 participants made 172 laps of Deck 5 of the *Lyubov Orlova*. The full marathon was held the next day with 92 competitors making 344 revolutions of Deck 6.

The 5th marathon is already being planned for King George Island 30 January 2002.

ATV Use Improves Ross Sea Visit Options

Heritage Expeditions, the New Zealand company which has conducted tourist voyages to the Ross Sea region since 1994, says that the scope of its operations in the south-west Ross Sea region has been increased following the successful operation of two all-terrain vehicles (ATVs) this season.

The ATVs are two eight-wheeled, plastic bodied, Canadian-built 'Argo' that were purchased by the company in late 1999. They were taken south by the company during the 1999-2000 season, but weather and ice conditions prevented them from being tested.

This year the vehicles provided Heritage's clients with access to Capes Royds and Cape Evans over fast ice in the south-west Ross Sea in January and February. The ATVs were also used to pick-up Norwegian trans-Antarctic trekkers Eirik Sønneland and Rolf Bae on 13 February (see *Antarctic* Vol. 18, no. 2, p. 43)

Akademic Shokalskiy, the vessel that Heritage Expeditions currently uses for its Ross Sea operations, is ice strengthened but has limited ice breaking capability. The fast ice that often lingers along parts of the Ross Sea coast well into summer, often extending well off-shore, presents a challenge for the company's tour operations, particularly in a heavy ice season such as this last one.

Passengers sit comfortably in inflatable naiads drawn on sledges behind the Argos as they cross the sea ice to Cape Royds. Photograph: Margaret Bradshaw

Heritage Expeditions' principal Rodney Russ doubts whether they could have visited the key historical sites of Shackleton's hut at Cape Royds, and Scott's at Cape Evans in mid-January without the ATVs. At Cape Royds the vehicles carried passengers three kilometres from the ship to shore, and at Cape Evans eight kilometres. The ATVs travelled fifty kilometres from the ship to Hut Point to collect Sønneland and Bae.

The ATVs towed specially designed and built sledges which carried Heritage's 'Naiad' watercraft. According to Russ the ATV and sledge reached a speed of around fifteen kilometres per hour. Each vehicle carried a driver and three passengers, while twelve people sat in the Naiad. The sledges carried emergency gear and all personnel wore flotation vests.

Rodney Russ was quoted as saying that his company did not plan to use the ATVs on the Antarctic continent itself. He saw the vehicles rather as 'an excellent way of expanding the areas we can visit during our limited time in the area, particularly during extremely heavy ice years like this'.

This season Heritage Expeditions ran seven "Expeditions of Discovery" around southern New Zealand and the Subantarctic Islands, with two visits to the Ross Sea. The company specialises in wilderness experiences and has won three tourism awards. Expeditions are small and cosy with a compliment of 46 passengers.

Daring Rescues Cheat Winter

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company in Canada and began an arduous journey to the Pole via South America and the Rothera British research base on the Antarctic Peninsula across from Chile.

On board were two flight crew, replacement doctor Dr Betty Carlisle, an engineer and a nurse. Their target was a 600m ice runway at the South Pole.

Associated Press takes up the story: *"With flaming debris marking an icy landing strip, a small plane fitted with skis has completed half of its perilous journey to rescue a sick American doctor at the South Pole. After a 10-hour flight from the Rothera base on the Antarctica Peninsula the eight seat Twin Otter became the first plane to successfully land at the Pole during the polar winter. The crew braved extreme winter conditions and flew through pitch-black skies as part of a swashbuckling effort to evacuate Ronald Shemenski, the sole physician among 50 researchers working at Amundsen-Scott Pole Station.*

After arriving at the end of the Earth, the plane's crew chose to remain for 10 hours to rest, refuel and assess Dr Shemenski's condition. A nurse at the South Pole helped take ultrasound images that were sent back to doctors in the United States for diagnosis. From Rothera, Dr Shemenski was flown to Chile for a flight to the United States.

Dr Shemenski was the replacement doctor for Dr Jerri Neilsen who in 1999 was the centre of her own dramatic rescue after she self-diagnosed a cancerous tumour in her breast. The first mid-winter flight ever made over the South Pole dropped medical supplies to allow Dr Neilsen to treat herself and she was rescued in early spring by a Hercules piloted by Major George McAllister, flying in from McMurdo Station on a 2500km round trip in six hours. That flight became the earliest ever post-winter flight in extremely hazardous conditions and captured media attention around the word.

– *Warren Head.*

Amazing Energy-efficient Antarctic Sea Urchin

How well do you think you would grow if you lived in a freezer? Adam Marsh, a marine biochemist at the University of Delaware, and colleagues Rob Maxson and Donal Manahan from the University of Southern California, have discovered an important reason why the pincushion-like Antarctic sea urchin *Sterechinus neumayeri* can function so well in the polar seas surrounding the Earth's frozen continent.

The Antarctic sea urchin demonstrates a remarkable economy, a super energy-efficiency in its metabolism. Despite frigid water temperatures and little available food, its babies can synthesise proteins more efficiently than any other organism recorded to date.

"All animals expend about 30% of their energy just turning over proteins," says Marsh. "But the embryos and larvae of the Antarctic sea urchin can perform this vital metabolic process using 25 times less energy than the rest of us. That's really amazing," he notes, "especially considering the extreme environment in which these larvae live and an almost non-existent food supply."

The Antarctic sea urchin resembles a red pincushion, about 5 inches in diameter, with long spines extending from its round shell. It lives on the seafloor and uses its spines and sucker-tipped tube feet to move about. Baby sea urchins are spawned during the summer months and take about a year to develop from embryo to larva to juvenile — a stage that is a miniature version of the adult.

To collect sea urchins for their study, Marsh and his colleagues cut holes in the sea ice near McMurdo and inched down a towrope into the freezing water wearing insulated diving suits that covered all but their faces. Their lips and cheeks would go numb after 60 seconds of exposure.

Once the sea urchins were collected from the seafloor, they were flown by helicopter to the Crary Laboratory for experiments. "The problem with collecting marine animals in Antarctica is not keeping them cold during the trip back to the lab but to keep the seawater in the coolers from freezing solid during the trip," Marsh explains.

Housed in the lab in cold water pumped in from McMurdo Sound, the female sea urchins were induced to spawn and the eggs were fertilised. The scientists then began measuring the changes in total metabolic rates as the embryos developed into larvae, along with corresponding changes in the rate of protein turnover, or metabolism. More than 10 million embryos were tested during the three-year project.

So what does identifying the most energy-efficient animal mean to the rest of us, besides making us feel metabolically inadequate?

"We know the Antarctic sea urchin can process proteins using less energy than anyone else," Marsh says, "but we don't know yet what mechanism allows the animal to do so much with so little. Finding the answer could yield some important benefits," he notes. "For example, if you could incorporate this energy-efficiency into a fish, oyster, or clam, you could feed it less food and get the same growth rate. That kind of capability would be a great boon to aquaculture."

The Plight of the Albatross

The plight of albatrosses continues to attract international attention. The British Antarctic Survey and Professor John Croxall are at the centre of various initiatives to improve the conservation status of species in this the most threatened of all bird families - chiefly due to the threats posed by commercial longline fishing.

The continuing enforcement of a sustainable management regime on the longline fisheries around South Georgia by the South Georgia Government and the Foreign and Commonwealth Office resulted in the third successive year of significantly decreased mortality of albatrosses and petrels. Losses are now only 5% of those five years ago, when new fishing regulations to protect seabirds were first introduced under the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR). Illegal and unregulated longline fishing now poses the major threat to South Georgia albatrosses. Professor Croxall was scientific adviser (with staff from the Joint Nature Conservation Committee) to the Department of Environment, Transport and Regions at meetings to establish a new international agreement to protect albatrosses on land and at sea under the Convention on Migratory Species. The text of an Agreement was finalised in February and the UK government has indicated its intention of becoming an early signatory to the new convention.

Wandering Albatross chick with a longline hook recovered from it.

During the year the New Zealand Government invited Professor Croxall to give a keynote presentation on albatross ecology to an International Fishers Forum, designed to enable fishers and fisheries managers to share experience of effective prac-

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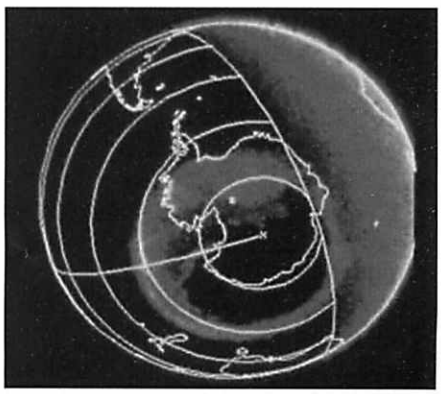
Breakthrough in Sun-Earth Connection Controversy

The Earth's environment receives not only radiant energy from the Sun but also kinetic energy from the solar wind. This energy modifies the Earth's upper atmosphere and near-Earth space environment, causing the aurora and affecting spacecraft operations and radio communications.

The amount of solar wind energy entering the earth's environment is regulated by a process known as magnetic reconnection that acts at the magnetopause - the interface between the solar wind and the outermost part of the earth's atmosphere. There are two major competing reconnection hypotheses that give different predictions for where reconnection will occur on the magnetopause and thereby how energy will flow into the magnetosphere. For 20 years, spacecraft observations at the magnetopause have been unable to decide between these hypotheses.

However, new developments in the remote sensing of magnetopause reconnection by ground-based high frequency radars have led BAS scientists, Iain Coleman, Gareth Chisham, Mike Pinnock and Mervyn Freeman, to devise and carry out a new experimental test between the two main reconnection hypotheses. The test predicts a very distinct and unusual radar reconnection signature to emerge for one of the two competing hypotheses for certain well-defined seasonal and solar wind conditions. Observations under these conditions using a global network of Arctic and Antarctic radars, of which BAS is a member, shows clear evidence of this signature and therefore provides strong support for the reconnection hypothesis known as the anti-parallel merging hypothesis.

Story Courtesy BAS.



Antarctica's "Aurora" as seen from space.

To drill or not to drill

Of all the great lakes of the world, only one remains untouched by humanity. The very existence of Lake Vostok, buried as it is beneath nearly four kilometres of ice in one of the most remote parts of Antarctica, was unknown when Soviet explorers serendipitously built a base directly above it in 1957. It was not until 1994 that satellite and seismographic measurements revealed the presence of Lake Vostok and its impressive size - almost equal in area to Lake Ontario but up to four times as deep. By this time Russian glaciologists had drilled three quarters of the way down to the lake to read 400,000 years of climate history recorded in the polar icecap. Cut off from direct contact with the sun, wind and life of the surface world for as long as 14 million years, Lake Vostok seems to scientists to be a unique time capsule that, once opened, could help solve old and difficult puzzles. Some technologists consider it the best place on Earth to test probes that are designed to bore through the icy shell of Europa, a moon of Jupiter suspected of harbouring a watery ocean and possibly life.

But many environmental activists disagree, and recently scientists and technologists have been stepping back from proposals they started making in 1996 to send robotic probes into the lake to analyse the water, look for micro-organisms and return with sediment samples. At a workshop sponsored by the National Science Foundation in late 1998, several dozen researchers drew up a timeline calling for penetration of the lake in 2002 and sample returns in 2003. In late 1999 a follow-up meeting pushed the mission back to 2004 at the earliest. Now previously bullish researchers concede that it may well be a decade before instruments are lowered into the lake.

Growing uncertainties of three kinds have forced this retreat. One question is whether and how a probe could be lowered into a subglacial lake without contaminating it with microbes from the surface or the ice above it. "The general idea is to drill down 3.5 kilometres or so with hot water and then deploy a cryobot," explains Frank D. Carsey, lead scientist on the ice-probe project at the Jet Propulsion Laboratory in Pasadena, Calif. After waiting for the hole above it to freeze shut, the cylindrical probe would sterilize itself, heat up and melt its way down to the lake, spooling electrical cable from its body as it goes. In September, Carsey's team showed that a simple prototype device could move through a few metres of ice. But almost no testing has been done on sterilization techniques, he says. "No body, national or international, has said how clean is clean enough," Carsey observes. "We need a target to work toward."

The cost, and who will pay it, is also uncertain. A project based at the Vostok research station has been estimated to run for $20 million. But the station sits above the southern tip of the lake, where freshwater is refreezing onto the icy ceiling. "There is a really good chance that we'll decide the best place to send a probe is the northern end, where the bottom of the ice is actually melting and nutrients in it"—salts, dust and microbes deposited with the snow eons ago—"are being added to the water," says Robin E. Bell, a geophysicist at Columbia University's Lamont-Doherty Earth Observatory. If so, then the project would require construction of new buildings, runways, fuel depots and other infrastructure at a northern location, dramatically raising the cost.

So far neither the NSF nor the National Aeronautics and Space Administration has offered to pay for the development of a fully instrumented probe or for the drilling. Carsey's grant from NASA to build a more sophisticated cryobot prototype was not renewed this year. "We'll have a completed gadget by this summer," he says, "but we may not ever be able to test it." He complains that "NASA is seriously dragging its feet" in sponsoring research on noncontaminating instruments for Vostok and Europa.

Until tests in less pristine settings, such as ice-covered volcanic lakes in Iceland, prove that a cryobot can enter the water without dragging along foreign life-forms, it is likely that conservationists will continue to oppose plans to penetrate Lake Vostok. "We firmly believe that a comprehensive environmental evaluation [required by the Antarctic Treaty] would not permit this to go forward with current technology," says Beth Clark, director of the Antarctica Project, speaking for a coalition of more than 200 environmental groups. In October the World Conservation Union adopted a resolution urging treaty members to "defer for the foreseeable future" drilling into the lake and to designate Vostok a "specially protected" area.

Perhaps the greatest uncertainty is whether Vostok is the only lake that can answer the important questions scientists are asking of it. Analyses of ice-penetrating radar soundings by Martin Siegert of the University of Bristol and others have turned up at least 70 lakes beneath the Antarctic ice sheet. Bell and other proponents of a Vostok mission have argued that Vostok is probably unique in a number of ways: in its sediments, in its depth, in its age, in its sloped ceiling (which may cause its waters to circulate) and in its possible geological origin as a rift in Earth's crust.

But preliminary results from new radar, magnetic and seismic data taken in January 2001 reveal just how little scientists truly know about Vostok. "The lake is not the big homogeneous feature we thought before," says Columbia geophysicist Michael Studinger. It contains "islands" where land meets ice and pockets where water rises to different levels. "Another surprising observation is a big magnetic anomaly" near one shoreline, he adds. And Bell, who with Studinger co-directs the radar study, reports that in places the water is 1,000 metres deep—almost twice what was previously thought.

Yes, Vostok is larger by far than any of the other subglacial lakes, Siegert

Remote Meteorite Sampling

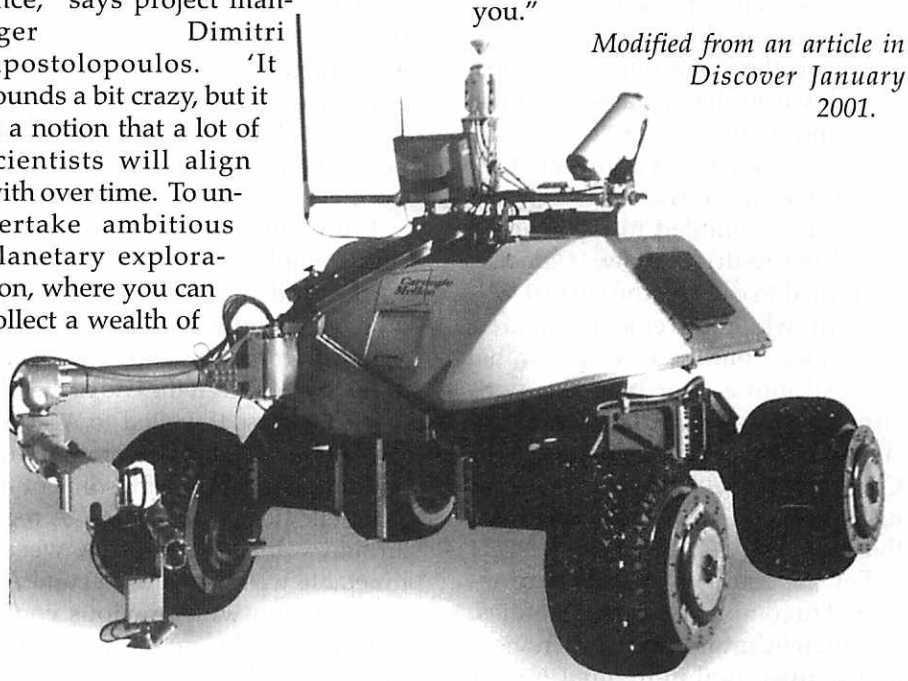
Antarctica is the closest thing to meteorite heaven that humans can find on Earth. Since 1969 scientists from the United States, Japan, and the European Council have discovered and collected more than 20,000 fragments of our solar system lying undisturbed in the barren, icy landscape. The meteorites include specimens from the Moon and Mars.

Each January when the continent's temperatures rise to a bearable level, scientists travel south in search of more extra-terrestrial remnants. This year, researchers from Carnegie Mellon University unveiled a tool that has spared them the numbing task of separating meteorites from what they jokingly call 'meteorwrongs' or locally derived rocks.

Their new tool, called NOMAD resembles a dune buggy on steroids. It is the first robotic rover with onboard intelligence. Previous planetary explorers, such as the Mars *Pathfinder* deployed in 1997, needed human controllers to tell them when to take photographs, collect samples, and send data back to Earth for analysis. NOMAD performs such chores without any prompting, roaming the terrain, mocking wind and cold. Using a laser rangefinder and spectrometer the robot painstakingly analyses every single rock in its path.

If NOMAD identifies a meteorite, it relays the co-ordinates of its site back to humans, who can pick the sample up at their leisure. This season NOMAD correctly classified five meteorites without human intervention, following on its successful premiere season last year. Scientists may employ future generations of the rover to explore other planets. 'Robots can be used for autonomous science," says project manager Dimitri Apostolopoulos. 'It sounds a bit crazy, but it is a notion that a lot of scientists will align with over time. To undertake ambitious planetary exploration, where you can collect a wealth of data, you have to build intelligent machines to do the exploration for you."

NOMAD and field team at Elephant Moraine in 2000.



Modified from an article in Discover January 2001.

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allows. But whether it is unique in more important ways is anyone's guess, he suggests: "It is the only lake where seismic data have been acquired. There may very well be sediments at the base of other lakes. As for the water depth, the same thing is true." The average age of the water in Vostok, one million years according to some estimates, depends crucially on whether it is connected with other lakes by streams beneath the ice. "All the other lakes have a sloping ice roof," Siegert adds, and he argues that "labeling Vostok as a rift valley lake is premature."

In July the Scientific Committee on Antarctic Research issued a statement that urged the investigation of smaller lakes first but maintained that Lake Vostok "must be the ultimate target of a subglacial lake exploration program." Siegert disagrees. "The goal should be to solve scientific problems," he says, "not just to explore."

Source – "Out in the Cold" by W. Wayt Gibbs, Scientific American, *March 2001*

The Plight of the Albatross

Continued from Page 63

tical measures to reduce seabird by-catch in longline fisheries. Extending and improving the use of such measures is an essential complement to political agreements, given that the two key problems confronting albatrosses and longline fishing are:

* Getting fishers to use simple and effective techniques for reducing seabird by-catch without effecting fishing efficiency.
* International collaboration to reduce the levels of illegal longline fishing.

During the year Professor Croxall was also involved in national and international campaigns which raised over half a million pounds towards albatross and marine conservation.

Gateway to Antarctic success

By Calum Revfem

It was a Christmas like no other for the twenty students and four staff on Canterbury University's Graduate Certificate in Antarctic Studies course.

The group, who spent 16 days in Antarctica, ate their sumptuous three-course meal seated at a giant triangular table carved from the Ross Ice Shelf. The students from a wide range of backgrounds participated in the course from November 13 - February 23, and as in previous years, found the lecture series delivered by prominent Antarctic scientists and key players invaluable.

Instead of the traditional post feast slumber, a 'fam' trip with Scott Base staff was made up the lower slopes of Erebus to the Imax crevasse. Roped up, the four groups made their way down to the crevasse opening. Once inside, the sheer size and majesty of the crevasse was revealed. A breath-taking journey through the crystal lens sounded to the squeaking of freeze-dried snow. Cameras attempted to capture the surreal violet light, while movement shattered broken ice from the towering walls. The exit into a clear blue sky, with superb views of Erebus and its signature steam trail, ensured that Christmas day 2000, would live long in the memories of all those who were there.

For the course students were required to complete four field studies, an Antarctic futures literature review and a supervised individual project of their choice. Students also worked in four syndicate groups to report on the following topics: Southern Ocean fisheries – for whose or what benefit? Antarctic discoveries – is success crucial, so long as the effort is honourable and any failure memorable? Valuing Antarctica – why, how and with what results? The state of the Antarctic environment – why, how and what can we learn and do? The syndicates made public presentations of their reports on the 25th of January.

A feature of the course was the 16-day field trip to Antarctica. Students spent time at Scott Base and six nights

Snow arches created by the Graduate Certificate students. Photograph: Margaret Bradshaw.

camped on the sea ice at Windless Bight. Four teaching staff accompanied the students to Antarctica – John Hay (course co-ordinator), Margaret Bradshaw (Geologist), Brian Stewart (Ecologist) and Margaret Elliot (Artist). The course is a key part of Gateway Antarctica's teaching programme, now under the newly appointed directorship of Bryan Storey (formerly British Antarctic Survey).

From the very beginning, the course emphasised the value of teamwork. Students were encouraged to work co operatively and make use of their different skills and areas of academic expertise. At the end of the first week the class travelled to Arthur's Pass for a weekend of team building and familiarisation with some of the Antarctic field equipment. A regular and valuable part of the weekly timetable was the Question and Answer session with previous course graduates, who acted as mentors throughout the programme. At the end of the second week students took part in a two-day intensive outdoor first aid course in preparation for their Antarctic field trip. The class had spent 12 days in a row together as a tight group. This was to prove invaluable preparation for the time down on the ice.

An exciting feature of the course was the use of video link lectures, with a nominated student acting as facilitator. Throughout the course students became proficient at working with the technology and developing their interviewing techniques. Regularly these links were held in the evenings to accommodate international time differences. They proved immensely popular and included Kim Stanley Robinson (author of the science fiction novel Antarctica, USA), Chris Rapley (director of BAS, UK) and Harvey Marchant (director Australian Antarctic Division, AUS) just to name a few. Students made the most of their access to a host of Antarctica's internationally recognised experts. John Hay and Bryan Storey's efforts in this area are reflected in the growing international recognition of the course.

The lecture series covered everything from Antarctic legal regimes to polar psychology. They were highly interactive classroom sessions and students were encouraged to challenge and debate ideas. The class was introduced to a wide array of Antarctic issues, with avenues of further inquiry provided for individuals to pursue. The syndicate projects required the four groups of five students to develop themes to address their particular topics. The emphasis was not solely focused on the written report and all groups had to consider the public presentation to be made. Working on an academic project in a group of that size provided its challenges. Group meetings and individual tutorials were held by staff to assist management of both the syndicate and individual workloads. This regular personal contact with staff provided a relaxed and informal learning environment, enjoyed by all the students.

Week five began normally until a flight schedule change meant that half the class had to leave for Antarctica four days earlier than anticipated. It was announced at 1pm on Monday and after selection of the advance party, it was action stations for those departing the following morning. For the advance party the first few days at Scott Base were spent preparing field equipment, setting up the Windless Bight camp and assisting in base activities. The team skills developed in Christchurch were brought to the fore as the group quickly found its feet and got stuck in with digging

snow from around the base. The perfect weather allowed for trips up Observation Hill, around the sea ice loop and for a lucky few to go skiing at the Scott Base tow.

On arrival the main party soon fitted in and event K396 were briefed on their upcoming Antarctic field training (AFT). Two days were spent perfecting snow-craft skills with ice axe and crampons, recognising and negotiating crevassed terrain, checking sea ice conditions and spending a night in emergency snow shelters. With a large creative contingent (and would-be engineers) the snow shelters constructed resembled all shapes, designs and sizes. For those who still had some energy left at the end of day two, there was the opportunity represent New Zealand in the annual rugby fixture versus USA, played out on the sea ice pitch in front of Scott Base.

The K396 contingent visited the McMurdo base, including a tour of the Crarey Lab and the Meteorological station and on December 19 a 'fam' trip to Cape Royds was organised. Two of Scott Base's Hagglund vehicles were utilised and a stop was made at Cape Evans to visit Scott's hut, before heading on to Shackleton's hut and the Penguin rookery at Cape Royds. For some of the historians in the group, the visit to the historic huts was recounted as the field trip highlight. Peter Cleary (Scott Base Operations Manager) accompanied the group through the hut visits and provided expert commentary. On the return journey an ice cave in the Erebus glacial tongue was explored, providing more of the day's spectacular photographic opportunities.

The field component included four separate studies that were carried out between December 20-26, based at K396 camp on Windless Bight. The studies included a geology project, supervised by Margaret Bradshaw, examining the formation of Castle Rock - a volcanic vent protruding from the spine of the Hut Point Peninsula. Brian Stewart co-ordinated a Weddell seal survey on the other side of the peninsula at Hutton Cliffs. Student groups were transported and accompanied to the field sites by Scott Base AFT staff Dean Arthur and

Students enduring the Antarctic weather on Castle Rock. Photograph: Margaret Bradshaw.

Rachel Brown. Daily weather observations were recorded at the K396 camp and the data was used by students in a human comfort and climatology study overseen by John Hay. Margaret Elliot was responsible for the Antarctic impressions project, where students were required to record their Antarctic experience in an artistic form. Part of this project spawned some interesting snow sculptures, several snow arches and pillars, a sundial and a snow whale amongst them. All four studies gave students first hand exposure to the realities of operating in an Antarctic field situation.

The weather during the period spent out at Windless Bight was not entirely favourable. High winds and poor visibility prevented the Seal survey being undertaken on one of the days and Christmas day arrived packaged in a cool mist. Undeterred and now accustomed to Antarctic field life, K396 students prepared a sumptuous three course Christmas lunch that was eaten on a giant triangular table, carved from the Ross Ice Shelf. Following the tradition of Captain Scott, presents were pulled from a sack and handed out in random order.

The reality of arriving back in Christchurch was accentuated by the 28-degree Norwester felt on opening the Hercules door. The class enjoyed a short break in which to reflect on their Antarctic experience, before reconvening in the second week of January. The lecture series continued while syndicate groups put the final preparation into their presentations and written reports. The public presentation of syndicate topics was well attended and included several international visitors. All groups were required to field 15 minutes of questions from the floor, a nervous proposition given the expertise of those sitting in the audience. The presentations were a great success and the Question and Answer sessions provided no major obstacle. The confidence to answer difficult questions was bolstered by the breadth of material covered in the course and after a summer spent interviewing the experts, the class had learnt a thing or two.

Calum Revfem is an Environmental Management Analyst, who was one of 20 students on Canterbury University's 2000/2001Graduate Certificate of Antarctic Studies course. John Hay, University of Auckland, who co-ordinated the course for the past three years, will be stepping down in 2001. I'm sure the previous classes would like to join K396 2000/01 in acknowledging the fantastic learning experience he created for us all. We would also take this opportunity to thank Bryan Storey, the staff of Gateway Antarctica and Antarctica NZ for the hard work they put in to make the course possible.

'Heatwave' stresses Penguins
Continued from Page 59

emperor penguins may be very susceptible to environmental variability."

Commenting on the work, British researchers said the Terre Adelie experience might not have wider implications - particularly with respect to any global warming process that could be taking place.

"The climate models give no clear indication of whether a global warming would mean more or less sea ice in future and how this might affect penguins," Keith Reid, of the BioSciences Division at the British Antarctic Survey, told the BBC "At the moment, there are no indications that the penguin is in trouble."

He added: "It looks like this could be a very localised effect just in this colony. A glacier in that area used to give protection to the colony but the front of it fell off in the 1970s and there were predictions then that the penguin population might go into decline. It's what you'd expect if it's less sheltered there."

Article courtesy BBC Online and BAS.

Antarctic courses at Gateway Antarctica, Canterbury University

Gateway Antarctica is the Centre for Antarctic Studies and Research at the University of Canterbury. The centre currently runs two Antarctic courses. The first, ANTA 101, is a one-year, multidisciplinary undergraduate course open to all students. It provides a wide-ranging introduction to all aspects of Antarctic Science, politics, tourism and environmental issues. It draws on the expertise of experienced Antarctic staff from ten University departments and includes local and national guest lecturers. The second, a Graduate Certificate in Antarctic Studies (ANTA 501-504) is a summer only course that gives a fourteen week in-depth immersion in the beauty, history, science, political discourse, environmental concerns and future challenges of the frozen continent and surrounding seas at a graduate level. The course was developed jointly by the University of Canterbury and Antarctica New Zealand with significant input from many other Antarctic experts. It includes a 10 day study trip to Antarctica supported by Antarctica New Zealand. Gateway Antarctica has plans to develop new courses and hopes to have a second level Antarctic Science course; a systems approach, in place by 2002. The course will focus on how the Antarctic science system works by exploring linkages between the Antarctic atmosphere, hydrosphere, cryosphere, lithosphere and biosphere, and try to predict what possible changes may take place in the future. Besides the above courses, Gateway Antarctica has plans to develop on-line distance learning. Professor Bryan Storey, Director of Gateway Antarctica, sees this as an exciting new development to bring Antarctic Studies to a wider audience in New Zealand and abroad.

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What's Eating Antarctica?

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nent's ice shelves suddenly decided to follow through collaboratively on a new-millennium resolution to shed a few billion tonnes of unsightly ice.

Despite appearances, it's unlikely that the coincidence of so many megabergs signals a wholesale collapse of the ice shelves, says Ted Scambos, a glaciologist with the National Snow and Ice Data Center in Boulder, Colorado. On the whole, he notes, the edges of each of Antarctica's largest ice shelves—the Ross, the Ronne, and the Amery—fluctuate around an average position.

Before last year, all three ice shelves stretched dozens of kilometres farther from the coast than they had in decades. For instance, the western portion of the Ross Ice Shelf, discovered in 1840, reached farther from the coast in early March 2000 than ever before recorded.

With such unusually large projections into the ocean, the shelves were primed to cast off big bergs. Now, the central and eastern portions of the Ross Ice Shelf have calved back to where they were in the early 1960s, says Stan Jacobs, a glaciologist at the Lamont-Doherty Earth Observatory in Palisades, New York.

"These calving events get a lot of attention due to the size of the icebergs, but in the long run, there's really not much net change in the position of the edge of the ice shelf," notes Jacobs.

Scambos says that it's not clear what causes an iceberg to break free from these three southern ice shelves. After all, each lies well within the region where average annual temperatures are below -5°C and the average summer temperatures don't rise above freezing. Therefore, it's unlikely that warming temperatures caused the recent spate of megabergs, says Scambos.

Instead, he says, the factors most likely at play here are tides, ocean currents beneath the ice shelf, and so-called katabatic winds—the cold, heavy air masses that can spill off the continent with hurricane speed. All these phenomena exert tremendous forces on rifts and other weak spots that form in the ice as it flows off the continent, begins to float, and streams around and over nearby islands.

Scambos says that he and other scientists are now developing a proposal for a research project that would place Global Positioning System (GPS) equipment and weather instruments on an ice shelf where there's a known rift. A primary goal of the project would be to collect data on an iceberg-spawning crack as it grows.

In the meantime, scientists are already monitoring a newly discovered crack in the ice shelf fed by the Pine Island Glacier, a fast-flowing ice stream that's thinning more rapidly than ice on any other area in Antarctica. In January, when Robert Bindschadler was looking at Landsat 7 satellite images of Antarctica, he noticed a 25-kilometre-long crack across this ice shelf.

The 400-m-wide crack hadn't been there the previous year, and analysis of recent images from other satellites shows it hadn't been there even 5 weeks earlier. After its initial growth spurt, the crack's progress slowed, and it now grows only about 13 m per day, says Bindschadler, a glaciologist at Goddard Space Flight Center.

In the next 12 to 18 months, the crevasse should completely cleave the 40-km-wide, 400-m-thick ice shelf and release an 800-square-kilometre iceberg. Although relatively meagre by Antarctic standards, the berg will contain enough ice to provide every person on Earth with a 25-pound bag of ice every day for the next 5 years. "Even small things in Antarctica are huge," Bindschadler quips.

Even though global warming probably isn't to blame for last year's megabergs, Scambos says that rising temperatures have been linked to ill effects along the coast of the Antarctica's northernmost peninsula. During a summer storm in January 1995, the Larsen A Ice Shelf, which covered 2,000 square kilometres, disintegrated into a flotilla of small icebergs.

This ice shelf's next-door neighbour, Larsen B, was also pummelled by the storm. It shed a big iceberg at that time and has continued to release small bergs. The outer edges of Larsen B now are closer to the Antarctic shoreline than ever recorded in the past.

The explanation for these ice shelves' demise may be the recent rise

in summertime temperatures in the area, says Scambos. He and his colleague Christina L. Hulbe, a glaciologist at the Goddard Space Flight Center in Greenbelt, Maryland, described this phenomenon last December at the American Geophysical Union meeting in San Francisco.

When the temperatures on the surface of the ice rise above freezing, the melting snow collects in crevasses atop the ice sheet. The pressure exerted by this meltwater deep in a crack drives it to open even further, weakening the ice shelf and making it vulnerable to winds and tides. This generates a large number of small icebergs, a process that Scambos says is much different from the one that takes place on the more southerly ice shelves.

He notes that the break-up of the Larsen B Ice Shelf has been slower during the past two years than previously and that satellite imagery didn't reveal any ponds of melted snow atop the ice last summer. Part of the reason for this could be La Niña conditions, a cooling of the waters in the equatorial Pacific Ocean that influences weather worldwide, Scambos says. That cooling, in turn, could have chilled air temperatures above the Antarctic ice shelves.

A return of El Niño, the warming of the equatorial Pacific, might spell the end for Larsen B because it could warm up the region and cause the ice shelf to shed even more bergs. Scambos says it's likely that the Larsen B ice shelf will continue to retreat and may even disappear within the next decade.

The icebergs that break free from the main ice shelves in Antarctica eventually make their way north and threaten the shipping lanes. The size of the bergs guarantees that they'll last a long time—one megaberg that calved in January 1992 wandered westward along the coast for 3 years before splitting in two. Then, the larger piece drifted eastward for thousands of kilometres before it finally broke up and melted in the South Atlantic Ocean in February 2000.

Before such bergs drift to tropical climes, however, they have to escape the shallow waters of coastal Antarctica. Driven by strong currents that sweep along the coast, the floating masses of ice jostle and bang their way along the ice shelf for hundreds of kilometres.

As the tides go out twice each day, the bergs take a long, slow slide downhill. When the tides return, the bergs slosh back into the ice shelf from whence they came, cracking off smaller bergs in the process.

Sometimes the currents drive the megabergs aground in shallow water, where they can be stranded for years. Two pieces of a large iceberg that broke free in 1987 were soon driven aground, and they remain where they landed.

A large piece of the Connecticut-size B15 iceberg that broke free from the Ross Ice Shelf in March 2000 jostled its way down the coast about 300 km before it was driven aground. When this piece—now merely the size of Rhode Island—became stranded near Ross Island, scientists were worried that it might break free and block the route taken by supply ships into McMurdo Sound, the site of many Antarctic research stations.

For the time being, however, the flat-bottom berg poses no threat to shipping. Even so, it may not be harmless. It is positioned near Ross Island's Cape Crozier and poses a direct and unusual threat to some of the area's wildlife (see below).

Recently, scientists visited this iceberg and installed GPS equipment and weather stations. If the berg ever floats again and moves into warmer waters, these instruments will help monitor its eventual break-up, says Douglas R. MacAyeal, a glaciologist at the University of Chicago.

It wouldn't be hard for people on a ship to detect and then steer around an iceberg that spans the horizon and towers higher than a 12-story building above the waves. However, when these frozen leviathans spawn legions of smaller bergs—similar in size to the pipsqueak ice cube that sank the Titanic—they give sea traffic reason to fear.

Icy obstacle blocks route to rookery

While a grounded iceberg near Ross Island's Cape Crozier in Antarctica poses no problem for shipping, it does threaten many thousands of penguins that breed there, says David Ainley, a marine ecologist with H.T. Harvey & Associates, an ecological consulting firm in San Jose, California.

Adélie penguins spend most of their lives at sea in feeding grounds that extend out about 70 kilometres from their Cape Crozier rookery, the largest in the area. But once every 2 years, the rookery's 120,000 or so pairs of Adélies come ashore to breed and lay their eggs.

Shortly before the chicks are grown, the adults return to the sea to feed on krill and fish. The chicks find their way to sea on their own soon afterwards.

Last October, while the iceberg was still on the move, the adult penguins swam to their feeding grounds through a 10-km-wide avenue of ocean. When the flat-bottom berg became stuck, that lane had narrowed to a 1-km alley.

Furthermore, the berg might be there a while: Because it's aground on the sea floor, the bottom of the iceberg won't be exposed to relatively warm ocean water that might eventually melt it free.

When it comes time for the penguins to return to their rookery, they'll find a sheer cliff of ice that stretches from the ocean floor to the sky—a wall they can't swim under or waddle over.

Adélie penguins are faithful to their colonies, even to the point of coming back to the same nest, says Ainley. When scientists studied the navigational abilities of Adélie penguins in the late 1960s, birds from the Cape Crozier rookery were relocated more than 1,000 km away.

It took the deported Adélies at least a year to return, Ainley notes, but return they did. This homing instinct, which normally brings the birds back to a familiar and safe breeding colony, may turn out to be their Achilles heel.

"It will be interesting to see if this iceberg causes the penguins to change their behaviour and emigrate to other colonies," says Ainley.

A small but rapidly-growing colony of about 1,600 emperor penguins, which lay their eggs in the same rookery, have been feeding at sea. Like the Adélies, they'll soon come back to face the daunting wall of ice, Ainley says.

By Sid Perkins, Science News, May, 2001.

Massive 2001 US Programme

A substantial increase in the overall NSF budget for 2001 (US$4,426 billion), has made it the largest on record. The Antarctic Research Program budget has had a 26.8 percent increase, and its Operations and Science Support program a 14.9 percent increase.

NSF spending for the 2000 Antarctic program, it's 44th year of operation, was approximately US$200. 23 million, of which $31.60 million was spent on research grants, $106.03 on operations and science support, and $62.60 million on logistics.

Long term US projects

Several NSF Antarctic science projects are long-term programmes. One is the study of the Antarctic Circumpolar Current, which transports 130 million cubic metres of water each second towards the east, making it the mightiest of the ocean's currents. The current is part of a global heat exchange system and is seen as the key to understanding rapid changes in world ocean circulation that have the potential of causing significant changes in global climate.

US research on Antarctica's marine ecosystem continues, leading to a better understand of the levels of harvesting that could take place without damage to the ecosystem.

Year-round US research on Antarctica's Ozone hole links in with parallel research on the abnormally high levels of the Sun's ultraviolet-B radiation that penetrate to the Earth's surface and into the sea each spring when more than half of Antarctica's stratospheric ozone disappears. Scientists are documenting how LTV-B affects the embryos and larvae of some species of Antarctic marine life.

Measurements taken at the geographic South Pole since 1956 have indicated changes in world levels of greenhouse gases such as carbon dioxide and methane. Measurements in the data-sparse Southern Hemisphere are important for predicting world levels of these gases and their influence on climate change.

The unbroken US record of weather data from manned and unmanned stations in Antarctica, now exceeds 30 years for some locations, providing a data base and real-time information from which to make operational forecasts, study the dynamics of the Antarctic atmosphere, and chart the progress of human-induced global warming.

The complex effects of climate, food availability, and human activity on penguin populations continue to be studied by the US program in the Antarctic Peninsula area. A decline in penguin populations at Litchfield Island, which only a scientist with a special permit may enter, suggests that it is difficult to blame the decline entirely on humans.

Long-term ecological research (LTER) continues at sites in the McMurdo Dry Valleys and along the west coast of the Antarctic Peninsula near Palmer Station. These sites are among 21 NSF sponsored LTER sites over the world that are being used to investigate ecological processes operating over long time and broad spatial scales. Chemical analysis of the Antarctic samples is done in the Crarey Lab at McMurdo.

Deepest ice core

Russian, French, and U.S. investigators have drilled and are now analysing the world's deepest ice core (3,650 metres) from Russia's Vostok Station in East Antarctica. The core represents 420,000 years of snowfall, and spans four glacial/interglacial cycles, providing scientists with an unparalleled archive of Antarctic climate history. The drill hole was stopped before penetrating to Lake Vostok, a huge lake the size of Lake Ontario sealed beneath the ice sheet.

This season the Support Office for Aerogeophysical Research at the University of Texas Institute for Geophysics, used a specially equipped Twin Otter to map a 205 by 102-mile grid over the subglacial Lake. Lake Vostok has been isolated beneath the East Antarctic Ice Sheet for millions of years and may contain different microbes from those known today. The radar survey is a necessary precursor to any future international effort to explore the lake. A clean drilling technology will be required to prevent contamination, and the ethics of continuing to drill is still under debate. However, there are reports that microbes new to science have already been found in the snow from the lower part of the drillhole. (See previous article P 64 for further discussion)

Investigators from U.S., U.K., Australian, and Swiss institutions are jointly trying to resolve whether the East Antarctic Ice Sheet has remained stable or collapsed during the Pliocene Epoch (2 to 5 million years ago), when the climate was warmer than now.

Astronomy by balloon

Antarctica's summer weather provided a 10 day stable ride for instruments suspended from a 275 m balloon floating around Antarctica above most of the atmosphere at a steady height of 42,000 m, providing a cheap way to get scientific experiments into near-space.

A spectrometer mounted on the gondola below the balloon tracked gamma rays emitted by neutron stars, black holes, and the centre of the galaxy. A suspended microwave telescope provided detailed evidence that the large-scale geometry of the universe is "Flat". Following the "Big Bang" 12-15 billion years ago, the universe was smooth, dense, and hot. The intense heat is still detectable as a faint glow called cosmic microwave background radiation. Scientists have been seeking high resolution images of the radiation since its discovery by a ground-based radio telescope in 1965.

Recovery of the gondola and instruments from the Polar Plateau by helicopter in December was not without is problems. The loose end of a strop holding the gondola wrapped around the rotor blade whilst the helicopter was about 15 m above the ice,

stopping the blades and ruining the transmission. The helicopter was recovered by a ski-equipped Hercules.

The University of Chicago (Yerkes Observatory) and 15 institutions from four nations have installed telescopes at South Pole Station to exploit the superb viewing in the clear, dry atmosphere. Infrared and submillimetre wavelengths are emphasized.

Neutrino detection and AMANDA

Investigators from the universities of Wisconsin and California (Berkeley and Irvine) with collaborators from Sweden and Germany are burying downward-looking photodetectors deep in the transparent ice sheet at South Pole to observe light produced by neutrinos (ultra-high-energy particles) when they collide with ice molecules after passing through the Earth. Data from the project will contribute to the study of galactic centres, dark matter, and supernovae.

The light produced by the collision of neutrinos with ice crystals is detected by AMANDA (Antarctic Muon and Neutrino Detector Array), an interferometric array of 13 microwave antennas at the South Pole. This is the fourth year of the AMANDA program. In the 1996/97 season AMANDA B was completed, which consisted of 302 photodetectors (Photomultiplier tubes) on ten strings placed in holes drilled to between 1500m and 2000m in depth, providing a detection area of 10,000m^2.

The following year AMANDA II was begun, which had an even greater detection area made possible by three more strings of photomultipliers installed fom 1300m to 2400 m in depth. The array was completed and calibrated in the 1999/2000 season and six further strings were added.

This year AMANDA measured cosmic background radiation temperature variations in a fairly large area of the sky above the station. The results are some of the most sensitive measurements ever made to help unravel mysteries of the early universe and the nature of the dark matter and energy that many scientists believe constitute most of the universe. Large aluminium "ground shields" have been added to enable the array to cover an even larger area of the sky with reduced noise.

Southern Ocean global ecosystem dynamics

Seventeen science teams are using NSF's icebreaker *Nathaniel B Palmer* and ice-strengthened *Laurence M. Gould* research ships to study how marine animals respond to natural and human-caused climate change. The ships are working in the Marguerite Bay area in the Antarctic Peninsula from March to August. The study will quantify processes that control the flux of carbon and other biogenic elements, so that predictions can be made on the response of marine biochemistry to climate change.

US Researchers are part of an International Trans Antarctic Scientific Expedition (ITASE) which will make an overland crossing of the West Antarctic Ice Sheet to determine changes in its mass and the climatic events recorded in the ice. The study has global implications and links in with both the Vostok ice cores (Antarctica) and ice coring in the central Greenland Icecap.

The Greenland cores (GISP2 and GRIP) have demonstrated that the Arctic has experienced large, rapid climate oscillations through most of the last 110,00 years on a scale that agricultural and industrial humans have not yet faced. these millennial-scale events represent quite large climate deviations: many degrees C in temperature, twofold changes in snow accumulation, order-of-magnitude changes in wind-blown dust and sea-salt loading in the atmosphere and large changes in methane concentration.

Changes during these events commonly occurred over decades or less. Dramatic shifts in the patterns of atmospheric circulation have been used to explain the rapidity and magnitude of these events.

New correlation techniques involving the gaseous composition of the atmosphere indicate that similar events are also recorded in the isotopic temperature record of the Vostok core from East Antarctica, although with smaller amplitude and a more ramped appearance than in Greenland. In a near-coastal ice core at Taylor Dome, results suggest that a high frequency complexity in climate is manifested through Antarctic synoptic systems that vary interannually in response to major atmospheric circulation systems such as the El Nino Southern Oscillations (ENSO).

Operational highlights

At McMurdo flanged joints on the fuel pipelines have been replaced with welded joints to eliminate leaks caused by gasket failures. The kitchen and dining facility in building 155 has been upgraded and a new science support center begun.

A multiyear project has been started to capture waste heat from the McMurdo power plant to heat feedwater for the reverse-osmosis water plant, and for space-heating the science laboratory, dormitories, and other buildings.

This season, the new electric power plant at South Pole Station became operational. Steel construction of housing and food-service wings of the new elevated station was started this summer. The wings will be completed during the winter. The South Pole rebuilding project will be completed in 2005 at a predicted cost of US$128 million. A multiyear upgrade of the two major buildings at Palmer Station is also underway.

This is the first season that Raytheon Polar Services Corporation, Englewood,Colorado, has provided operational support to the U.S. Antarctic Program under a contract with NSF that could extend for 10 years.

The US Program is ensuring Antarctic environmental protection by cradle-to-grave management of supply and waste stream. It is achieving this by environmental monitoring and research, source-point sorting and removal of all solid and hazardous waste from Antarctica, of which approximately 65 percent is recycled (the average for recycling in USA is 16 percent), and through a comprehensive spill prevention and cleanup program. Fuel hoses and tanks are now double-walled or bermed.

OVER MY SHOULDER

Ham on ice

Neville Copeland, call sign ZI2AKV ex ZL5AL, recalls a winter on ice at Scott Base during 1972-73.

Editor's note: Radio operators use a type of verbal shorthand to describe their work, and a translation is shown in parenthesis.

Many tales have been told of the intrepid south by abler pens than mine, but, for what it is worth, here is a glimpse of life as a ham on the ice. During the first 17 years of scientific research at Scott Base there were numerous amateur operators who no doubt will be recorded in the history of wintering over when an official version is published at some later date. The two original foundation members of the fraternity were Peter Mulgrew and Ted Gawn during the first wintering at Scott Base in 1957.

It was of great interest to those souls who had lived at Scott Base to hear many years ago that the old establishment was being rebuilt. Q hut was pulled down first and replaced with modern prefabs. The other huts were progressively replaced and a desalination plant established to save the long-suffering mouse humping ice blocks into the melters. New building continues to this day, and sad to say the Post Office no longer exists.

I was thrust into the hurly burly of Base routine just before Christmas 1972 as a rush replacement for the appointed postmaster, who had to return to New Zealand. A hurried week of medicals, x-rays, dental checks and a brush up on Post Office procedures, plus the settling of my private affairs, was the prelude to my trip south.

In those days the summer season was an extremely busy one for post office staff. There was a fluctuating population of some 1500 at McMurdo 2 miles away, as well as up to 30-40 on Base, all of whom wanted stamps and toll calls at the same time. In addition, different ships were visited in port once they had docked at McMurdo after the passage of the icebreaker, and stamps were sold as well as the PRO's books.

My official job as Post Master was shared with Lester Price (call sign ZL5AP) until early February. From that time on I was alone with my technician Allan Dawrant to nut out all communication problems. Perhaps I may go down in history as the last full-time morse operator working an "inland" station, as Olivetti teleprinters were installed for telegraph traffic the following year.

Neville Copeland on the ice.

After Les returned to New Zealand I was saddled with three daily CW (Carrier Wave – used for morse) schedules with the International Telegraph Office in Wellington where I had been previously employed. Plus daily afternoon radio telephone schedules with Island Services Wellington, and three evening radio telephone skeds on Mondays, Wednesdays and Saturdays. It may be of interest to CW operators with a service background to know that the Z code was used almost exclusively for control of the telegraph circuit with the odd Q signal sandwiched in. There were two old 1938 vintage teletype Wheatstone keyboards, very worn out and hopeless for traffic, but which could be used for punching up call bands for loading into the Morse auto when opening a sked.

The above routine had to be fitted in with Base chores and many was the time that I huffed and puffed my way into the radio room to meet a sked clad in down gear and mukluks. Consequently it was a battle between work and propagation to get on the air and pursue my hobby.

Having brought little equipment with me due to the short notice of my departure, I commenced CW transmissions on 14040 kHz using a 7020 rock (jargon for a crystal with that frequency) in one of the old RCAs (Radio Corporation of America radio equipment) hooked up to the transmit rhombic (the big aerials at Scott Base) in late February. The old DSIR quite naturally forbade amateurs operating during the busy summer season to preserve security of their communications. The arrangement was cumbersome and inflexible and only lasted a short while. A little later I

was lucky enough to be able to borrow a Collins KWM2A from our American friends through the gap. These sets are used extensively for communicating with American field parties. The only snag was that they required a 110 volt generator to be lugged in the rear.

At Scott Base we were ambidextrous power-wise and the 110 volts on station was no problem. I set myself up in a corner by the RCAs on the technician's small workbench (see photograph). Being close to the aerial patch panel too made a difference for a coax hook-up when commercial skeds were finished. The Collins set would poke out about 150-200 watts, and when communications were good I had no trouble raising North and South America, Europe, Russia, and Australia.

My old enemy was the adjacent Ionosonde, which gave a 22 second vertical burst every so often. The American machine some 2 miles away was a horizontal affair and gave no trouble. We in the Post Office were full of glee one day in January when the laboratory's roof leaked during a thaw and their aerial lead-in bowls filled with water putting the wretched Ionosonde out of action for a few days. We had our problems too with the leaks, but they were mostly in the public foyer and over the PRO's desk. Luckily the radio room roof held for the week or so of panic. If I remember correctly there was a photo published nationally by the NZPA showing Butch the cook sailing boats in his flooded kitchen!

I suppose I was fortunate in gaining some 630 CW (carrier wave) QSOs (shorthand for 'radio contact') during my stay down south. I have no yardstick to go by, but I am still receiving the odd batch of QSLs via the bureau (A QSL was a card posted to the radio operator to acknowledge message received, with information on signal strength, exchange conditions, date and time, and personal details of the receiver). I worked some of the Russian Antarctic stations, but missed the Aussies, although I chatted via teletype to a New Zealander working for them at Mawson Station.

Mel Pennington (call sign WB5APF/KC4) was at McMurdo that year and ran KC4USV with his devoted band of helpers (including the padre) at the 'Hamshack' (radio room) above the road to Scott Base. I was an official member of the shack having gained my patch by punching up marsgrams at odd times. The Navy have Mars circuits (Military American Radio Service for patching in calls between service men and their families) just outside the ham band on 14 MHz and most of the phone and fsk (Frequent Shift Keying – like teletype) patches back to the States are worked in this region or on 40 metres. Dave Porter was the main handler in the States for this type of traffic, and I believe he employed a staff of about six people.

Neville Copeland's radio.

The only other ham that year was Don Baker (call sign WB5JJK/KC4) from Stanford Research Institute who ran the satellite tracking station. He operated a beautiful 100ft full rotatable beam at Arrival Heights for contact with his parent university. He also was in the phone patch business (but not fsk) and would sandwich this activity in whenever possible. At his own laboratory in downtown McMurdo he ran a KWM2A with a 1000w linear amplifier on the side for general hamming. I was offered a linear too, but due to space considerations couldn't fit it in at Scott Base.

So as you can see I was doubly fortunate in having open house at these

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"Ham on Ice"
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other three outlets for the odd QSO (radio contact). During my term I acquired a bug (type of semiautomatic morse key) from the Americans to send some 12,500 groups of stock take traffic from the Leader back to Christchurch, and also used this on the ham rig.

Midwinter, the Christmas of the Antarctic continent, was a time of great festivity. I was late mouse and can vouch for the sorry state of the mess and myself the next morning. At the dinner each Base member presented another with a hand-made present. I drew the cook's name out of the hat and made him a three-foot inscribed wooden spoon out of a piece of 4x2. In turn I was given a wonder electronic gizmo by a laboratory technician, which spells out "courage sacrifice devotion" (inscribed on the American polar medal), at 12 wpm in honour of my being a CW fiend. I nearly ended up with a 5 second self-destruct tape recorder based on "Mission Impossible" but there was some problem with the $C0^2$ bottle I believe!

Having left the mainland (New Zealand) in a great hurry I had the problem of QSL cards too (acknowledgement cards – see earlier), but luckily Whitcombes came to the rescue with a rush rubber stamp that ended up on stock take cards when the small stock of cardboard was used. I sent the bulk of the card out on Winfly at the beginning of September, with the later QSLs following me out in late October.

I was thankful at times during the dark days to have my hobby, although communications dropped out in May and didn't came back in strength until the beginning of August. Other memorable experiences include an adventurous field trip manhauling to Castle Rock; visiting the historic huts; visiting the Dry Valleys; assisting with the annual seal kill (for dog tucker); winning the "best groomed" beard award; sunset and sunrise parties; a rough 60-mile trip over the sea-ice to Marble Point; exploring various ice caves; and lastly waiting impatiently during a week of blizzards to return to New Zealand.

FEATURE

The Reconstruction of Scott Base

by Murray Mitchell

Editor's Note
Originally built for a few years only, Scott Base still exists today, bigger and better than before, with only one of its original buildings remaining.
Between the early 1970s and 1988 Scott Base was completely reconstructed, with only minor additions and changes since then.
In 2000 the New Zealand Institute of Professional Engineers (IPENZ) honoured the new Scott Base design with its Award, commemorated by a plaque and citation now in the main entrance of Scott Base.
Murray Mitchell was one of the team responsible for the redesign of Scott Base and he recalls the challenges that had to be met before a new, world-class base could be achieved.

The original Scott Base was erected in 1956 to provide accommodation for New Zealand's 1957 International Geophysical Year (IGY) projects and to support New Zealand's part in the Commonwealth Trans-Antarctic Expedition (TAE) [See *Antarctic* Vol. 14 no 4 p123; Vol 15, no 1, p22-24; no 2, p46-47; no 3, p71-74; no 4, p75-98]. New Zealand contribution for the TAE was the laying of supply depots on the Ross Sea side of the Antarctic continent. That first building, designated A Hut and now known as TAE Hut, was officially opened on 20 January 1957. This was the Mess at Scott Base for many years. Other buildings followed. Intended for a few years only, those first six buildings, joined by covered walkways, served New Zealand well for approximately twenty years. By then increased demands on the Base had made it clear to Antarctic Division Director, Bob Thomson, that it was necessary to redevelop and rebuild Scott Base. This task was to utilise the energy and skills of many people. Here is one person's account of some of the design challenges posed by such an extreme environment.

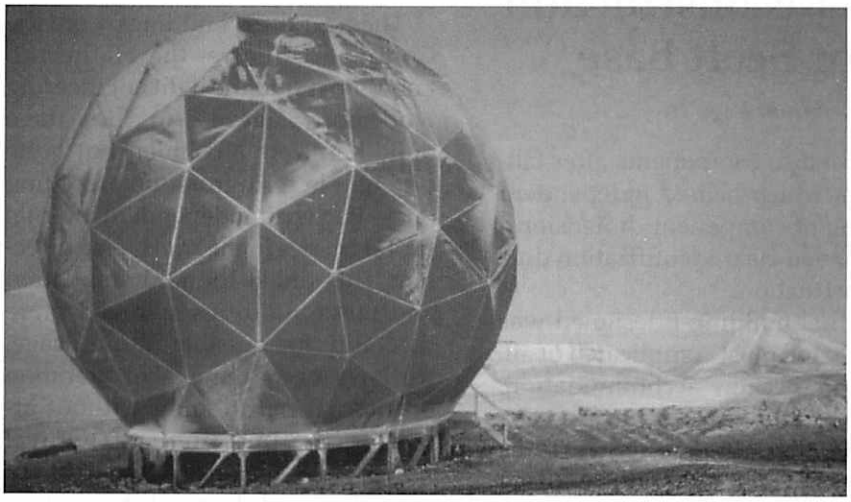
In the early 1970's, responsibility for the redesign of Scott Base was assigned to the Christchurch Office of the Ministry of Works, a move that coincided with the establishment of the Antarctic Division of DSIR in Christchurch. I moved from Wellington to Christchurch in 1978 and took over responsibility for the structural concept and design of the Scott base redevelopment. I was privileged to be part of a design team that comprised architects, structural engineers, mechanical engineers and others employed by the design section of MOW, a company now operating as Opus International Consultants Ltd.

As with the original structure, the aim was to design a base that provided safety and security in an extreme environment as well as comfortable living and working space for the people living there. Inevitably, budgetary constraints had to be part of any equation too. The re-construction began with the building of Q Hut in 1976-77, and its completion the following season. Throughout the redevelopment programme the pattern was to erect the building shell during the one summer season, then to enclose and secure it against the coming winter. The following summer the internal building – linings, partitions and services (ie plumbing, fire protection, power, air-conditioning, telephones) would be completed. This approach has been modified in recent years and much internal finishing is now completed by some of the wintering- over personnel prior to the following summer.

One of the foremost requirements for buildings in Antarctica is warmth. Designing for heat production was the task of mechanical engineers who included Martin Barrett and Ross Major. It was critically important on the structural side to retain that warmth and the answer to this lay in the choice of cladding materials. The

original base used insulated plywood panels manufactured in Australia. The choice of cladding panels changed during reconstruction. The first building, Q hut, used 200 mm thick prefabricated panels, clad with plywood and lined with gibraltar board. A polythene vapour barrier was installed behind the gibraltar board lining to prevent the water vapour created by people within the building from freezing to form ice in the fibreglass insulation. The Q hut wall panels were heavy to transport and erect, and provided only limited insulation. Subsequent buildings at Scott base used strong, lightweight cool-store type panels which are easily handled and provide effective and reliable thermal insulation. These were manufactured by two or three New Zealand companies. The powerhouse (Stage 2), accommodation, ablutions and mess (Stage 3a, 3b), administration (Stage 4), Hatherton Laboratory (Stage 5), light workshop and standby powerhouse (Stage 6) and heavy workshop (Stage 7) all used polyurethane foam exterior panels with steel sheet facings. The most recent building erected at Scott Base, the 1999 ablutions block, has polystyrene insulation in lieu of the polyurethane foam as the New Zealand manufacturers of the previous panels have all ceased trading. This is unfortunate because over the normal temperature range experienced at Scott Base (-50°C - + 5°C) polyurethane foam provides substantially greater efficient insulation than the more familiar polystyrene foam. For the purpose of comparison, polyurethane panels in the living and accommodation buildings are 150 mm thick, whereas the polystyrene panels in the stage 8 ablutions block are 250 mm thick to provide equivalent insulation. The current buildings at Scott Base are very well insulated, and require less heating to maintain a comfortable living temperature than conventional domestic buildings of similar size in temperate New Zealand

Typical cladding panels used for stages 2 to 7 were subjected to rigorous load and adhesion tests supervised by the Ministry of Works, prior to acceptance. A number of very long wall panels manufactured for the high gable walls of the heavy workshop (Stage 7) failed the load test. Subsequent investigation of the panel, by pealing back the panel facing, revealed an area of low-density foam near midspan, which could have failed in service under wind loading had it not been detected.



Telecom satellite Earth Station at first crater on Arrival Heights. Photo: The late Garth Varcoe.

Ice heave and the build up of snow beneath buildings is a major problem in polar building and reducing this was another challenge. Ice heave often occurs when warmth from within a building causes melting of the snow beneath the floor. When the melted snow refreezes it expands putting upward pressure on the flooring with destructive results. Every time this cycle recurs the problem grows. Prevention is much easier than dealing with the problem once it begins.

Before starting the rebuilding of Scott Base, wind tunnel tests were carried out on a scale model of the base at MOW Central Laboratories in Gracefield to investigate methods of reducing the deep snow drifting on the leeward side of the original buildings. The tests showed that constructing buildings on stilts, about 800 mm above ground level with an unobstructed air space beneath, would prevent or substantially reduce deep snowdrifts forming around buildings. Based on this investigation subsequent buildings at the base have been built above ground level on piles. The first two buildings, Q hut and the powerhouse, were built on steel stilts, but during erection on site, these buildings required difficult and time consuming excavation of the frozen scoria foundation to create foundation pads at a common level. Observing construction of the powerhouse, and mindful of the short construction period available, I designed subsequent buildings on timber pole platform foundations. These foundations are easily adjusted to fit the ground's natural contour on site by using a chainsaw. Most snowdrifts around the base are now limited to areas where the design air space beneath buildings is obstructed by temporary storage containers adjacent to the buildings, or adjacent to short lengths of building with inadequate ground clearance.

When faced with the prospect of building within the very short time window that the brief Antarctic summer provides, it is necessary to incorporate into the design the ability to build quickly. You could call it the "Lego" factor—designing a building where as much as possible has already been constructed and pre-fabricated before the materials arrive on Base.

Design and prefabrication of buildings in New Zealand, suitable for erection at Scott Base by the New Zealand Army construction team, imposed special constraints. Individual building components had to be lightweight and suitable for erection by hand as there was no crane at Scott Base until after the heavy workshop was completed in 1988. They also had to be easily assembled at subzero temperatures, by workers with gloved hands and simple hand tools. All building components were code marked and scheduled on the drawings. These markings were

Continued on Page 76

The Reconstruction of Scott Base

Continued from Page 75

transferred to components after fabrication, which helped independent checking of component dimensions, and allowed clear identification during construction.

The first building I designed was probably the most complicated of all. This was the new accommodation, ablutions and mess building. The building was to be erected on three levels in order to follow the existing ground contours. Our advice from those on the spot at the time had been that it was not possible to excavate a horizontal site in the frozen scoria to allow the building to be all on one level. Our thinking on this was later to change. To familiarise the building construction team with what they would have to do, we decided that a trial run of the building erection would be a good idea. The Army provided the construction team to go South and the ideal location for the trial run was the King Edward Barracks. This site was perfect. It provided a huge, open, covered space with plenty of height and room to spare. The Army, by skill and ingenuity, was able to replicate within the Barracks the sloping construction site on which we would build at Scott Base. The whole exercise clearly showed the necessity to uniquely identify each building component by type and number. We devised a system of building by numbers! It highlighted the need to dimensionally check all components prior to despatch. This was followed and stood us in good stead for all subsequent building in Antarctica. Any awkward procedure would be at least twice as difficult working in sub-zero temperatures. It was excellent to identify and work through many of the possible difficulties in an unpressured environment.

Over the years the New Zealand Army was to supply the construction team for each stage of the re-development. The team was new each time, sourced from a different military base, and whilst there was no continuity of personnel, each group did an excellent job, under difficult working conditions.

The next three buildings were the Command Centre, the Hatherton Laboratory and the light engineering workshop (Stages 4, 5, 6). These three buildings were all similar but quite different in form from the preceding ones. Each had independent internal portal frames in the transverse direction. This, unlike the accommodation and mess buildings, allowed more flexibility for possible future usage. It allows for the removal or alteration of internal partitioning without affecting the building's structural strength. One feature of the light engineering workshop is its heavy timber floor, providing the added strength necessary to support heavy engineering machinery and the stand-by generator. A unique feature of that generator is that it is supported on airbags to prevent the transfer of machine-generated vibrations through the building structure. The two generators in the powerhouse are supported on separate steel piles into the ground beneath the building. The airbags have proved to be an innovative and very successful alternative.

The heavy engineering workshop (Stage 7) includes a number of unique features. These include a suspended concrete floor slab capable of supporting a twenty two tonne point load in any location. As a result, tracks on the Caterpillar D-8 bulldozer (the heaviest vehicle in the fleet) can be removed and serviced in the warmth and shelter of the workshop. It is to be regretted that the design brief for the workshop did not include helicopter servicing, as a minor increase in building height would have allowed undercover helicopter rotor and turbine removal. The concrete floor, covering an area of 600 square metres, was pre-cast in New Zealand. By careful design and detailing it was erected on site in two days using a team of eight people. This was an achievement of which all involved can be proud. This workshop was the last of the major buildings to date in the re-construction programme. Subsequently an additional small ablutions block has been added adjacent to Q-Hut in 1999.

A feature of all Antarctic building that must always be addressed in the logistical planning is transport of materials from New Zealand to the continent itself. Up until the completion of Stage 6, the light engineering workshop, all building components to construct and enclose the building shell were transported early in the season by air. That was to change with the heavy pre-cast concrete components for the heavy workshop. These were transported south by ship at the end of one construction season and erected on site the following summer.

By the end of 1988 Base reconstruction was substantially complete and the next major project at Scott Base was the Antarctic Telecommunications Project, code named SES, Satellite Earth Station. This was a major Telecom project involving Telecom, the then Ministry of Works and the New Zealand Antarctic Programme. At the time of its construction and successful commissioning in January 1992 it was the southernmost permanent telecommunications satellite link in the world and opened a whole new communication era.

A feasibility study was commissioned in 1989 for a suitable site close to Scott Base. The criteria were: **1.** An unobstructed view of the satellite; **2.** Adequate access for construction of the 9 metre diameter antenna and its enclosing 15 metre geodesic dome on a raised foundation (to prevent snow drift packing underneath which could obstruct the bottom metre or so of the antenna.); **3.** It required either a guaranteed 100% reliable independent power supply, or to be supplied via a cable from Scott Base or McMurdo Station.

The satellite is located in a geostationary orbit and is in continuous line of sight, only 6 degrees above the horizon. Telecom identified five possible sites from New Zealand, four on Hut Point Peninsula, and one on Black Island. Black Island provided the best view of the satellite. Unfortunately it was a remote site which would have required building and maintaining a separate independent power supply. This would have been a very costly alternative on a site inaccessible for maintenance during the winter months. Crater Hill was rejected because the steep sides of the crater made access almost impossible for construction machinery and line of sight to the satellite was obscured by Mt Erebus. Of the remaining three sites – Knob, First

Scott Base, Antarctica. Photo: Antarctica New Zealand Pictorial Collection.

Crater and Second Crater, First Crater at Arrival Heights offered the best view of the satellite and an established access road for the construction. It also allowed a landline link from Scott Base, which would provide a reliable power supply as well as a fibre optic communication cable. The site I recommended was on top of First Crater, adjacent to a Designated Site of Special Scientific Interest (SSSI). During construction Telecom made the decision, on technical grounds, that it was necessary to relocate the antenna site 10 metres. This effectively located it within the SSSI, a controversial decision that I had difficulty accepting.

The feasibility study for the site was carried out early in the summer season of 1989 and one significant memory is of working survey instruments in thick gloves. In fact at times it was almost impossible, as many will know, and you are forced to remove the gloves and bear the cold. During the construction phase two years later a major difference we experienced compared with construction on the Base was the wind. The winds blew almost continuously, 30-50 km per hour much of the time. The late Garth Varcoe would put the anemometer out of the window of the Toyota before we even got out of the cab on site! When we discovered that the wind blew less between 2.00am-8.00am we scheduled erection of the lightweight geodesic dome panels for then. The typical triangular panels were the height of a man and behaved effectively like a kite in windy conditions. The foundations of the dome, like Scott Base, were built above ground to preclude snow build up. The success of this project is reflected in the clear and reliable telephone communications Scott Base has with the rest of the world.

One final project, which perhaps can be viewed as a mobile camp with links to Scott Base, was the multi-national Cape Roberts deep-drilling project site. New Zealand's contribution was to provide accommodation and the drilling-rig. The construction of this temporary base was very different to that for Scott Base. After much brainstorming with Jim Cowie and Alex Pyne the idea of converting standard insulated shipping containers was arrived at. These were to provide high quality, secure, warm, durable accommodation for living, working and research laboratory space. The original decision was to design and build half a dozen special sledges to transport the container buildings to the camp and drill sites at Cape Roberts. However we decided it was effective and efficient operationally to provide a dedicated sledge for each container. This proved very satisfactory and the ease and flexibility with which the 40 sledges, drilling rig and many container buildings could be moved contributed to the success of the project. I have to confess to a few sleepless hours prior to off-loading of the drilling rig from the Italian ship *Italica* on the sea ice 20 kilometres offshore. The rig weighed around 20 tons and I could only hope that it would not descend through the ice to the bottom of the sea. The ice was thinner than I would have wished and did crack as we carefully towed it on a very long cable to the safety of thicker ice. The opportunity to design the sleds and drilling rig was an interesting variation from other work I had been involved with.

The Antarctic part of my working life has been one that I have valued enormously. Space does not allow mention of the many people I have been fortunate to meet and events I have been part of over the years. The apparent simplicity of these buildings belies their sophistication, not just structurally, but in the power supply, heating and fire safety systems designed by the mechanical engineers, and the reverse osmosis water treatment system designed by Wolfgang Janata of New Plymouth. The success of the buildings is reflected in the fact that other countries have chosen to adopt some of the methods we developed in designing Scott Base to deal with the challenges posed by the Antarctic environment.

Antarctic Bases No. 1

Terra Nova (Italy)

Italy became a Signatory to the Antarctic Treaty on 18 March 1981, and legistration was passed by the Italian Government for a National Programme for Research in Antarctica (PNRA) on 10 June 1985.

The first Italian expedition to Antarctica was mounted during the 1985-86 season, partly to begin scientific research on the continent and largely to identify a suitable site in Terra Nova Bay for a permanent base. Construction of the base was started the following season, which allowed Italy to become a full Consultative party to the Treaty. In 1988 Italy became a member of SCAR during the XX SCAR Meeting held in Hobart, Australia.

Italian tracked vehicle alongside the Twin Otter at Terra Nova Bay during movement of a scientific party into the field. Photo: PRNA

The Italian Programme has manned the base for 15 consecutive years, steadily expanding both the base and its scientific programme. The programme has successfully collaborated with other nations, such as France, United States, Germany, New Zealand and in the multinational Cape Roberts Drilling Programme. In 1996-97 it constructed the Concordia Base at Dome C for deep ice coring. The Italian Programme includes almost 300 personnel.

Terra Nova Base is resupplied annually by several ships, which dock at the wharf or the edge of the sea ice in front of the base. Most personnel arrive by Italian C-130 Hercules, which lands on the fast sea ice in a nearby bay close to the base. The first Hercules landing at Terra Nova Bay was made in November 1990. Sometimes a Twin Otter is also used for field parties. Several helicopters, charted from Helicopters New Zealand Ltd, are regularly used from the base and are transported from New Zealand by ship at the start of each season.

Terra Nova Base is built on a north-south trending granitic peninsula in Terra Nova Bay south of Gerlache Inlet on the coast of the Northern Foothills. The base is built on bedrock well above the sea, but there is easy access to a wharf in a bay to the northeast and to the fast ice to the northwest. It provides summer support for its very varied science programme, and a staging post for its more remote field events in northern Victoria Land and on the Polar Plateau. Many of the buildings for science and accommodation are modular in design and easily erected. There are a predominance of slate blue and red colours.

In 1997-98 the base had 1250 m^2 allocated to labs, offices, management and leisure and eating areas. Various astronomical observatories, aquaria and specialised labs occupied a further 460m^2. The 400m^2 set aside for accommodation has been substantially increased this season. Technical services, such as the power plant, fresh water plant, incinerator, water-treatment plant and the helium and nitrogen liquifier occupy 450m^2. Carpentry, electrical and mechanical workshops occupy 500m^2 while 1200 m^2 is set aside for storage. A 15m research boat is drawn up on a slipway when not in use.

The base is powered by four diesel generators (2x140kW and 2x300kW). Freshwater is from a desalination plant and treated wastewater is discharged at a cove south of the base. There is a network of roads for up to 44 vehicles, including large transporters used during the unloading of cargo.

Photos of Terra Nova base continue on Page 82.

Foothold on Antarctica

The First International Expedition Through the Eyes of its Youngest Member

by Charles Swithinbank. Reviewed by Wendy Lawson

This book describes the Norwegian-British-Swedish Antarctic Expedition 1949-1952 from the perspective of its youngest member, Charles Swithinbank, who was 22 at the time of his selection. The expedition established a base called Maudheim in Dronning Maud Land, at 11 degrees West, and spent two years there making a wide range of scientific observations and measurements, some of which were highly significant and ground-breaking at the time. In more general terms, the expedition is significant in Antarctic history, in that it was the first Antarctic expedition that was international in its conception, planning and membership. With shades of our own Cape Roberts Project, there was an international committee comprising members of the three national committees that steered the planning and operation of the expedition.

The book is very much a personal account, and seems to be based partly on memories, and partly on extracts from diaries written at the time. The resulting style is charming - in a very Oxbridge way. The description near the start of the book of the selection process to which Charles Swithinbank was subjected is characteristic. Apparently, the then Director of the Scott Polar Research Institute, Launcelot Fleming, who was interviewing the young Charles for a position on the expedition, quickly dispensed with formalities on realising that he was dealing with a proficient rower. Instead, they went out on the Cam in a pair-oared boat, and Charles was duly tested for his teamwork and strength. He passed this practical test with flying colours, and was added to the expedition's staff.

The fifty years that have elapsed between the expedition and the writing of this account mean that there is a certain lack of immediacy in the prose, that is not completely balanced by the greater sense of perspective that those 50 years might bring. In many ways too, as Charles points out, the great scientific achievements of the expedition were overshadowed by those of the much larger efforts of the International Geophysical Year that took place shortly afterwards in 1957-1958. However, although it took me a while get 'hooked' into the book, I surely did. Some of the most enjoyable and memorable aspects of the book relate to the descriptions of the relationships between the men and their main mode of transport - the dogs. The sense of growing mutual respect and affection, the sense of humane and compassionate – and yet sensible - treatment of the dogs is strong and a pleasure to read. The other aspect of the book that is both interesting and heart-warming, and something on which Charles Swithinbank reflects at various stages, is the commitment to mutual cooperation that developed between expedition members from different nations that formerly had extremely competitive approaches to Antarctic activities. There was also no formalisation of any class distinctions within the group once they reached the base, although they were initially required to divide between officers' and crew's mess on the whaling boat on the journey down.

The expedition was led by John Giaever, a Norwegian from Tromso, who was is his late forties. According to the book, John Giaever spent long periods at Maudheim closeted in his small bedroom area, apparently having an awful time of it, as revealed by extracts from his diary. This refreshing sense of honesty and lack of judgement about different people's experiences of expedition life is in stark contrast to the stiff-upper-lip accounts of 'awful places' of earlier years. In many ways, then, this expedition seems to have marked a change from the intensely competitive, heroic era of Antarctic activities, to the cooperative, scientific, modern era, as well as to what some have called the 'mechanised age'.

Some of the expedition's findings were highly important, and the book describes the glaciological ones (about ice depth, ice velocity, grounding line dynamics) in some detail. Indeed, it is fascinating to find that of the expeditions 15 or so members, several of them (Robin, Schytt as well as Charles Swithinbank himself) have been significant in term of glaciology in the last 50 years, and many of the others have been significant in other areas of Antarctic.

This was a truly scientific expedition, where scientific work - much of which would be considered routine monitoring in today's output-oriented environment - was the raison d'être of the expedition, and the real reason for its journeys and explorations. It was tightly staffed: the ratio of support staff to scientific staff was small, with the scientific staff providing most of their own support. It was a catastrophe in more ways than one when three of the expedition's members were killed in a terrible accident, and left the rest of the expedition reeling and wondering how they would cope. By the time I reached the end of the book, I was left with a sense of understatement, a sense of respect for the honesty and frankness of the account, and for the expedition and its achievements. Also, a sense of sadness for the unnecessary loss of life that occurred, as well as recognition of an expedition that was ahead of its time in terms of international cooperation and streamlined scientific focus. All in all, Charles Swithinbank's memories of the expedition that probably defined his subsequent career probably won't knock you off your feet – it is not a melodramatic account - but it will set you thinking about the transformation of Antarctic operations, and indeed of society in general, through the twentieth century.

Dr Wendy Lawson is a Senior Lecturer at Canterbury University, Christchurch, with an international reputation for her glacialogical research in Antarctica and New Zealand. She is also on the Board of both Gateway Antarctica, *and Antarctica New Zealand.*

BOOK REVIEW

British Polar Exploration and Research

A Historical and Medallic Record with Biographies 1818-1999

By Lieut. Col. Neville W. Poulsom and Rear Adm. J.A.L. Myres CB (Savannah Publications, 2000)

As a researcher and collector of polar medals for 17 years, an updated and revised edition of Lieut. Col. Poulsom's 1968 work *The White Ribbon* had been anticipated for several years. The result is a book three times the length of its predecessor.

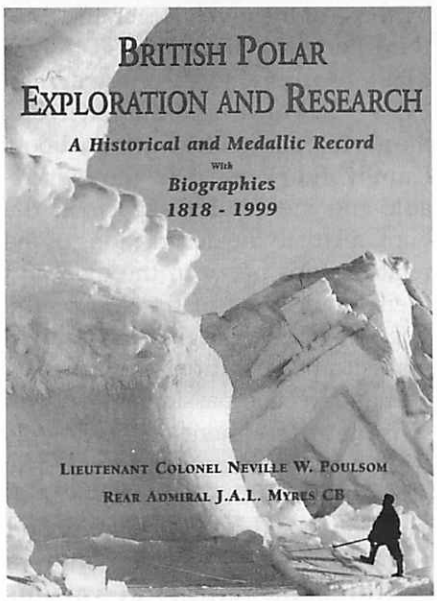
The text of the new work regarding descriptions of the primary medals concerned (Arctic 1818-55, Arctic 1875-76 and 1904 Polar Medals) and related expedition histories, was essentially taken directly from *The White Ribbon*.

On an early Antarctic note, the introductory paragraph to Franklin's last expedition says that the *Erebus* and *Terror* "...had been used by Sir James Clark Ross in his three memorable voyages in the Antarctic in 1839-43 (for which there was subsequently no medallic recognition)." It should be noted that Ross did request an Arctic 1818-55 Medal (First Arctic) for his crews, but it was refused by the Admiralty. As several of these men also participated in Arctic voyages which qualified for the award, it's a pity that a full listing of these "north and south men" was not included in the book.

The heart of this reference work lies in the biographical and medallic information. There is no doubt that there has been a wealth of data added since the publication of *The White Ribbon*, and that this information will benefit collectors and researchers for years to come. I am mystified, however, by the minefield of errors and omissions due to the severe underutilization of published data and original research available to the authors.

Some 250 pages contain an alphabetical listing of persons eligible for the First Arctic Medal, along with varying amounts of information. Though this section has many biographical details, much of what is in print in various books has been left untouched.

When Poulsom has "No medal issued." by a man's name, he is assuming the blank in the Remarks column of the original roll means a medal was never issued for that individual. I asked a long time medal researcher about this, and this person replied: "I agree that the lack of positive information is an insecure basis to decide categorically whether or not a medal has or has not been issued." Perfectly genuine named/attributed medals may forever be frowned upon because there was "No medal issued.".



One of the sections of the book that I was particularly keen on seeing covers the Arctic 1875-76 Medal (Second Arctic). A wealth of information exists in published sources *alone* regarding both officers and other ranks who participated in this expedition. However, a mere 14 pages are devoted to the 155 recipients of H.M.S. *Alert* and *Discovery*, and the private vessel *Pandora*. It is difficult to understand why two well known books about the 1875-76 voyage were not consulted (at least, they are not listed in the bibliography), as they contain much useful biographical information. These are Capt. Sir G.S. Nares' *Narrative of A Voyage to the Polar Sea* (two volumes/1878) and Rear Admiral A.H. Markham's *The Great Frozen Sea* (1894). In addition, a survival rate of 45% for this medal is stated in the text, when in fact, a further eleven medals exist in private collections and institutions.

Turning to the 1904 Polar Medal, which covers expeditions for both the Arctic and Antarctic and is still issued today, it is pleasing to see so many details under the recipients' biographies. Unfortunately, mention is not always made of polar services for which no medal/bar was awarded to the individuals. The particularly frustrating thing about the biographies concerns the listing and handling of recipients' medals and artifacts, which in several cases are not mentioned at all.

Oddly, the style of noting individuals' awards changed from the First and Second Arctic Medals to the Polar Medal. In the former, the existence of medals is stated in the text, but in the latter, individuals' *entitlements* are simply noted in the vast majority of cases. As with the Arctic Medals, it would have been so much more meaningful, from a collector's and researcher's point of view, to include various artifacts and documents accompanying the Polar Medals. Finally, the medal rolls do not differentiate bar only awards (except in one instance) to men who already had a Polar Medal.

I wrote earlier about omitted information and in fact, there is wasted space in the book's design, thus allowing for more information if more thought had been put into this area. For example, it was repetitious to print the various gazette entries, and other authorities, *three times*, thus needlessly taking up space. Much is made in the book about the different years of service on the *Discovery* Investigations' Bronze awards (1925-39), and this could have been condensed down to a couple of pages with years of service included in brackets after the men's names.

The next area of concern is the chapter titled "Other Medals and

Medallions". The Royal Geographical Society (R.G.S.) medallic information is enhanced by a list of recipients of Royal Medals, but remarkably, descriptions of the Special Medals lack any mention of naming.

In the case of medals issued by the United States government, some were issued officially named, but this is only mentioned in one case. The special British Sea Gallantry Medal (Foreign Services) given to certain Americans who searched for Sir John Franklin is incorrectly referred to in a First Arctic biography, and is not described at all in this chapter. Also, the Grinnell Medal is mentioned in the First Arctic section, but is absent from this chapter.

A final note addresses the images of recipients. Only officers' pictures are published for the First and Second Arctic Medals, and the quality of these images varies. It seems odd that the engraving of George Strong Nares wearing only his First Arctic Medal was used, since a fine portrait photograph exists showing him as a Vice Admiral, wearing *both* First and Second Arctic Medals mounted together and the insignia of a Knight Commander of the Bath (Civil). This photograph is even mentioned in the text.

It would have been nice to see varied images, such Danish Eskimo Dog Sledge Driver and Interpreter Johann Carl Christian Petersen, French Navy Ensign Emil DeBray or the Greenlanders Hans Christian Hendrik and Johan Frederik Wille. Known images of the first two individuals show them wearing their First Arctic Medals, as well as other awards, and all these individuals served on British expeditions.

It was a pleasure to see a photograph of one of the few women to receive the Polar Medal, Dr. Margaret Ann Bradshaw. This New Zealand scientist "...made a major contribution to the New Zealand Antarctic Programme over a period of 17 years.". The bar on her medal reads ANTARCTIC TO 1992, and she is pictured wearing the award.

Glenn Stein is a polar historian with a deep interest in official and unofficial medals awarded for polar exploration and scientific study. He is a dynamic teacher, designer and artist at the University of Florida, USA.

BOOK REVIEW

LET HEROES SPEAK

Antarctic Explorers 1772 - 1922

by Michael H Rosove,
Published 2000, Naval Institute Press Annapolis, Maryland, USA.
US$34.95.
Reviewed by Baden Norris

Until I read this work I was of the strong opinion that the world at large had more than sufficient Antarctic histories, most of them flawed through a lack of balance. Strong nationalistic leanings mar their efforts to portray the subject objectively.

In my opinion, the better of a very mixed bunch was the production by Readers Digest 1985, *"Antarctica"*; that is until *"Let Heroes Speak"* appeared. It is rare indeed to find such a well researched, fair and very readable account of the fortunes of a whole group of men from various nationalities and backgrounds united in the desire to unravel the secrets of the frozen south.

Spanning the period from 1772 with James Cook to 1922 and Ernest Shackleton's final expedition, it almost covers the most important period of Antarctica, its locating, charting, exploration and exploitation.

I say "almost" because, for reasons unexplained, it fails to make any reference to the expedition of 1910 by Nobu Shirase in the *Kainan Maru*. I would have thought this expedition warrants mention before, say, that of John L Cope.

This omission aside, the reader is introduced to a full and exciting history of the continent, warts and all.

From Cook onwards each probe into the southern polar regions is examined, each leader's achievements are measured, not, I am pleased to note, in comparison with others, but in isolation. As a consequence, a fairness is achieved that is not often present in histories of this nature.

The reader is helped through the pages of *"Let Heroes Speak'* by the provision of adequate black and while illustrations, complimented by maps of the polar areas.

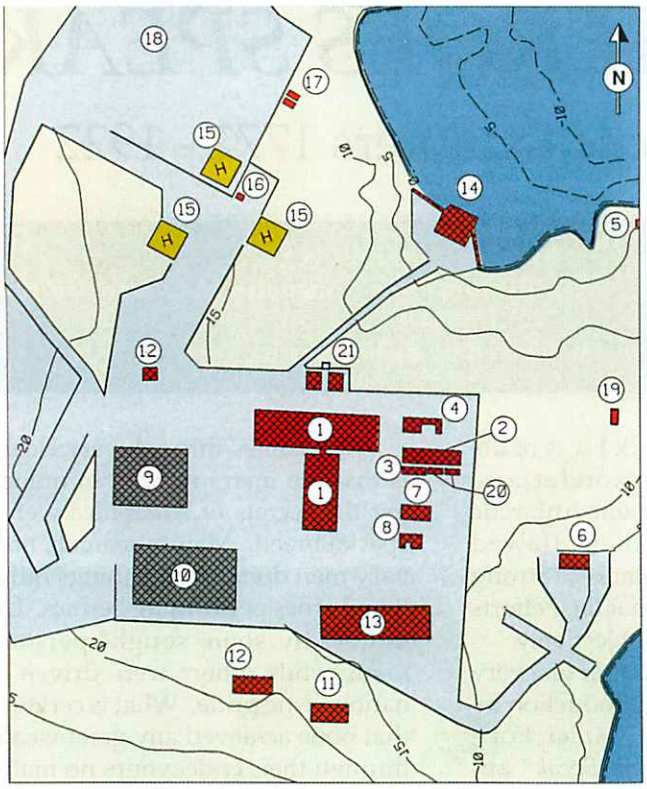
What comes through very clearly is that the men involved in unlocking the secrets of Antarctica were a special breed. Mainly seamen, ordinary men doing heroic things rather than heroes performing heroics. Undoubtedly some sought personal fame, while others were driven by nationalistic pride. What is certain is that none achieved any great wealth through their endeavours no matter what the motive had been.

The author must be congratulated for achieving such a fine balance in a subject that has many pitfalls for the unwary. He, with skill has avoided "taking sides" in many issues that plague Antarctic history. What he has produced is a book that demands a place in every polar library and a prominent place on the bookshelves of all who are interested in the subject.

A minor blemish, which may anger citizens of Lyttelton, is the repeated misspelling of the port's name. Despite this, there is no doubt that this is the best book on Antarctic history to surface for many years.

"Let Heroes Speak' by all means, but much more important is to "Let Heroes be Heard". Well done, Michael Rosove! Through writings such as these we are at last starting to listen.

Baden Norris is one of New Zealand's foremost Antarctic historians and is Curator of Antarctic History at Canterbury Museum. He was a member of one of the earliest groups to revisit the historic huts after they were "abandoned" and helped to free them from the build up of ice and snow. He currently serves on an Specialist Advisory Committee to the Antarctic Heritage Trust and is a frequent lecturer on tour ships to the Antarctic.



1. Main building - 2 Power-generators - 3 Fuel tanks for generators - 4 Desalinators/ nitrogen and helium liquifiers and geological laboratories - 5 Sea water pumps - 6 Water treatment plant - 7 Incinerator - 8 Fuel distributor/battery recharging station/ hyperbaric chamber - 9 Warehouse hanger - 10 Workshop and vehicle hanger - 11 Guest rooms - 12 "Pinguinattolo" recreation area - 13. Warehouse containers - 14 Wharf - 15 Helipad - 16 Helicopter fuel pumping station - 17 Helicopter fuel tanks - 18 Future expansion area - 19 Geomagnetic laboratory - 20 Integrated automated module - 21 Aquarium/ laboratories

Left: Plan of Terra Nova Base. PRNA.

The Italian supply ship Italica against the sea ice in Terra Nova Bay. Photo: PRNA.

Terra Nova Base

Continued from Page 78

Terra Nova Base nestled amongst granite outcrops. Photo: PRNA.

Space mapping catches Antarctica in motion

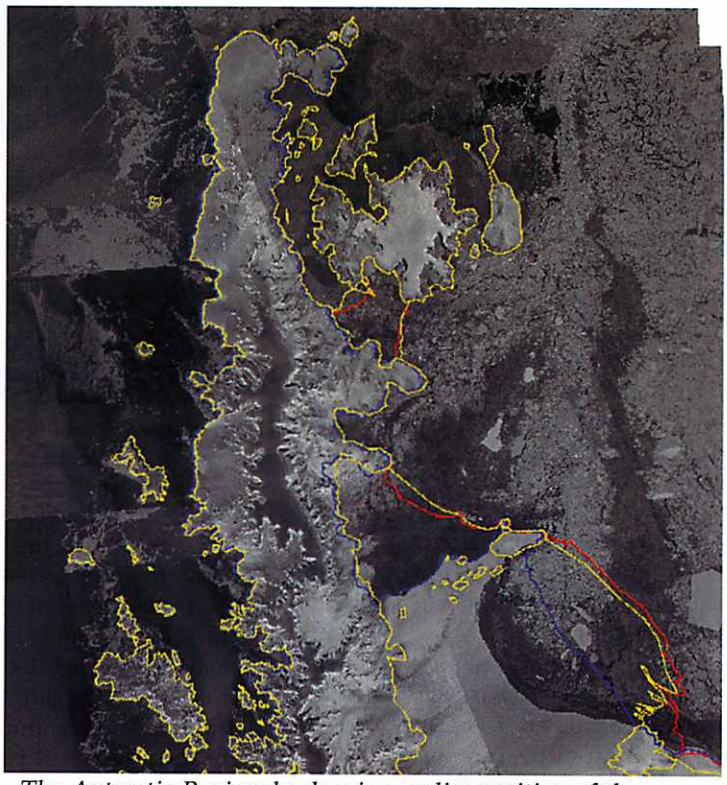
Antarctica may appear to be a land frozen in time, but it certainly is not still. Glaciers spread from the continent's centre to the sea, icebergs break off and crash into the ocean, and great "rivers" of ice snake through the ice sheet, evidence of a dynamic relationship between this remote continent and global climate.

A joint NASA and Canadian Space Agency mission now provides a more comprehensive view of how the Antarctic ice sheet moves and changes and may help answer some fundamental questions about whether the ice sheet is advancing or retreating.

The initial mapping campaign, the 1997 Antarctic Mapping Mission, resulted in the first high-resolution radar satellite map of the continent. The second phase, the Modified Antarctic Mapping Mission completed November 2000, once again charted Antarctica with space-based imaging radar. This second mission allows scientists to see how the continent has changed over the past three years as well as a wealth of new information on the movement of the most active region, the marginal half of the ice sheet.

"The 1997 map became a benchmark for studying changes on the continent and also revealed fascinating features, including enormous ice streams in East Antarctica, that we had never seen before. We expect to find even more surprises from this second, even more detailed map that will help us unravel some of the mysteries behind how our global environment behaves," said Dr. Ghassem Asrar, Associate Administrator for NASA's Office of Earth Sciences, Washington, D.C.

For the new mission, the Canadian Space Agency's RADARSAT-1 satellite trained its imaging radar on the marginal half of the continent twice during each of three consecutive 24-day periods, ending 14 November 2000. "The mission was a challenge for us because we had to accurately navigate the satellite to within a few hundred metres of its nominal track on each orbit," said Rolf Mamen, Director General of Space Operations at the Canadian Space Agency.



The Antarctic Peninsula showing earlier position of the Larsen ice shelf edge. Photo: NASA.

Precise navigation and data from the six passes have made it possible to create detailed topographic maps and to measure the speed of the moving glaciers. "Most of the Antarctic ice sheet moves imperceptibly slowly but nevertheless surely," says science team member Dr. Frank Carsey of NASA's Jet Propulsion Laboratory, Pasadena, California.

"This mission gives us an overall snapshot of how the ice moves and how it is changing. By measuring the extent and velocity of the moving ice and estimating its thickness, we can estimate how much ice may be lost into the ocean from Earth's largest storehouse of freshwater," Carsey added. "These calculations are important for understanding Antarctica's contribution to the present rate of sea-level rise of about two millimetres, or the thickness of a dime, a year."

Mission scientists are now developing velocity maps that show the direction and speed of the ice. They have already created the first-ever complete velocity maps of the spectacular Lambert Glacier, a sinuous ice stream more than 500 kilometres long, which reaches speeds of more than one kilometre a year once the ice spreads onto the Amery Ice Shelf.

They are also beginning to create a new map of Antarctica for comparison with the one made in 1997. The process of turning the radar images into map-quality mosaics will take about a year to complete.

"We already can see several glaciers along the Antarctic Peninsula coastline where the ice edge has retreated over 30 kilometres in just three years. But this is not the whole story. We also see places where the ice sheet is advancing, such as the Amery Ice Shelf. The Antarctic Ice Sheet is huge, and this is the first time we have the data to study and compare ice sheet behaviour around the entire continent," says mission principal investigator Dr. Kenneth Jezek, of Ohio State University's Byrd Polar Research Centre. "These data will help us determine whether the local changes we see represent expected, episodic behaviour or whether they represent regional trends driven by changing climate. "

Source: NASA Press release

TRIBUTE

Robin Langford Oliver

21 December 1921 – 1 February 2001

Robin Oliver was a true 'Old Antarctic Explorer' and looked the part. He was born in New Zealand, the son of Dr. W. R. B. Oliver, Director of the Dominion Museum in Wellington from 1928 to 1947. Robin entered Victoria University College (University of New Zealand) in 1939 and studied geology under Charles Cotton. In 1943 he completed his Master's degree, and shortly after was called up for military service.

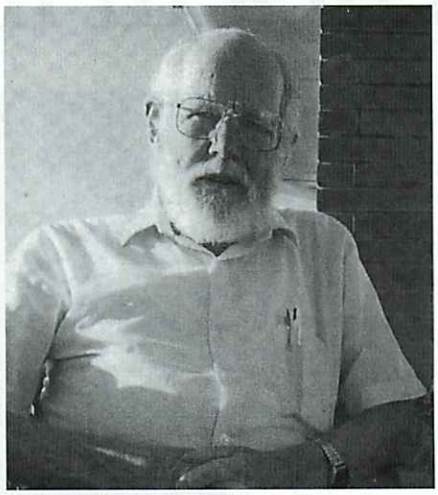
Like all students of the early 1940's, the exigencies of war impinged on Robin's studies in various ways. His major contribution to the war effort was as a 'Hardy Man' in 1944 and 1945, a coast-watcher for enemy ships on wind-swept Subantarctic Campbell Island. Any spare time was used to study the geology of the island, and with Charles Fleming, another Campbell Island coast-watcher, and Harold Finlay he subsequently produced *The Geology of Campbell Island*.

Back home, and now with the New Zealand Geological Survey, Robin made too close a study of a volcanic eruption of Mt Ruapehu, and with a badly burned leg, was forced to observe the V-J Day celebrations from a hospital bed. It was during this period with the New Zealand Geological Survey that Robin first met his future wife, Helen Pirie, who had studied geology in Auckland.

Robin spent 1946 to 1949 as a geologist with Shell in Venezuela after which time he enrolled as a doctorate student at Cambridge. Here he met up with several other New Zealanders and married Helen Pirie.

After completing his Ph.D. Robin was offered an assistant lectureship at Oxford but in 1955 joined the Canadian Photographic Survey Corporation as a photogeologist. In this capacity he visited Ceylon and Pakistan, where he was kidnapped by a gang of renegades and held for a short time.

In 1958 Robin was appointed lecturer at the University of Adelaide, where he remained for the rest of his working life, rising to senior lecturer. He became involved in Antarctic research and made seven trips to Antarctica (1959-60, 1961-62, 1964-65, 1970-71, 1976-77, 1980-81 and 1981-82). His first trip was part of an eight-man survey and geological Expedition to the lower Beardmore Glacier organised for 1959/60 by the New Zealand Alpine Club. In January 1965 he was aboard the *Nella Dan* when it was struck by a freak storm off Wilkes Station. The wind rose from dead calm to 50 knots in only five minutes and the ship was struck by a giant wave that tore away the ship's motor boat and rubber landing pontoon. Robin was part of the small party who set off in the launch to retrieve the escapees in very rough seas.



Robin Oliver on a visit to New Zealand in 1999.

Robin had two seasons in the Vestfold Hills (1970-71, 1976-77) and in 1980-81 accompanied ANARE to Herring Island and Casey. His last Antarctic fieldwork was in 1981-82 when he was part of a joint Australia-New Zealand-US party to Northern Victoria Land. Robin's Antarctic involvement is commemorated in Oliver Bluffs in the Beardmore Glacier region.

Robin officially retired in 1982 but this meant little change to his routine. He was a key figure in the Fourth International Conference on Antarctic Earth Sciences held in Adelaide in i982. Lectures, seminars and conferences continued as if nothing had happened.

Some wonderful stories exist about Robin's academic forgetfulness. Such as the time he couldn't find his car after a day at the university and reported it to the police as missing. The following night he went out as usual to his car, automatically remembering where he had left it and was stopped by the police on his way home for driving a stolen car. The one about the time Robin went back to his university office in the middle of a lecture he was giving to fetch something, but instead sat down at his microscope and forgot about his waiting students, is even better!

A couple of years ago Robin stoically took part in a rigorous South Island fieldtrip after the International Symposium on Antarctic Earth Science that was held in Wellington. As late as mid-January this year he was at the Allan White Symposium on S-type granites at La Trobe University in Melbourne where he was seen to be as fit and active as ever. He was 75 before he gave up cricket, squash, tennis and abseiling.

A week after returning from the Allan White Symposium Robin suffered a severe stroke. He never recovered and died on 1 February aged 80 years.

– By Alan Mason

James Maurice Maitland Caffin, MBE

1 August 1912 - 13 January 2001

James Caffin was eminent in journalism and Antarctic affairs. Widely known as Jim, he was educated at Mt Albert Grammar and Christchurch Boys High School. From there he passed on to Canterbury University College. In 1931, at the age of 19 or 20 he joined the staff of the Christchurch Star and Times but moved to the Wellington Evening Post in 1935 and onward to the New Zealand Herald in Auckland later the same year. In 1941 he returned to Christchurch to take up a position with the Christchurch Press where he remained with one short interruption for war service until he retired in 1977. For twenty years he was the newspaper's Chief Reporter and in addition Literary Editor from 1974 until retirement.

It is said that his interest in Antarctica was inspired by an interview with Rear Admiral Richard Byrd on his second Antarctic Expedition 1933-35. His interest led him to an involvement with the New Zealand Antarctic Society where he was Canterbury Branch Chairman (1975-76) and President of the Society in 1977-78. His major contribution to the Society however, was as Editor and major contributor to the Society's quarterly bulletin *Antarctic*, producing 43 issues spanning over a decade. During this period the magazine grew to be a respected and trusted voice on Antarctic matters, largely as a consequence of Jim's wide knowledge and contacts. Jim provided lively thumb-nail sketches of Antarctic exploration and research gathered from a range of personal contacts scattered across the world. Jim corresponded with members of most national programmes and *Antarctic* reached over twenty countries.

Jim Caffin MBE.

As a result of this activity Jim amassed a major Antarctic archive now housed in Canterbury Museum. His contributions to Antarctic knowledge and communication were recognised by the award of an MBE in 1984 and the naming of a valley in his honour in South Victoria Land, near Mt Bastion.

Jim Caffin's contributions to the community were not limited to Antarctic affairs and his integrity as a journalist is indicated by his concurrent position as a correspondent for United Press International, Associated press, the Sydney Daily Telegraph and contribution to American magazines. He was also interested in other media and was a founder member of the Christchurch Film Society. He organised the first international documentary film festival held in New Zealand in 1950.

Writing was not his only interest, he was keenly interested in Aviation and in 1953 was asked to join the management committee for the London to Christchurch air-race held to celebrate the development of Christchurch International Airport.

Amongst the highlights of his full and interesting life numbered his two visits to Antarctica in 1959 and 1961 during the exciting period when New Zealand's involvement in the IGY was metamorphosing into an ongoing commitment to Antarctic exploration and research. Few media visitors to the continent have been as successful and committed advocates of Antarctic involvement as Jim Caffin.
– *By Keith Clegg.*

Caffin Valley, Antarctica.

Colourful Antarctic Tartan

A new tartan (left) has been designed by Celtic Originals, a small tartan business on the Isle of Mull in Scotland, to provide those who visit the continent with more than just memories. The tartan will also raise funds to help support Antarctic conservation. The British Antarctic Survey was approached for help and approval, and the UK Antarctic Heritage Trust was suggested as a worthy charity of support for the preservation of Antarctic Historic Huts.

The tartan visited Antarctica this season, when BAS photographer Chris Guilbert took photographs of scientist Keith Reid wearing an Antarctic Tartan shirt on Bird Island. Bas said "The British Antarctic Survey have welcomed this initiative in pro-

Continued on Page 86

NEWS

Colourful Antarctic Tartan

Continued from page 85

viding a different and artistic interpretation of the beauties of the Antarctic. We believe that the generous gift of profits from this enterprise could materially help in the conservation of our Antarctic heritage sites."

The colourful tartan was inspired by various images in Alistair Fothergill's book Life in the Freezer, especially the book's cover photo of two King penguins. The colours forming the tartan are white, grey, orange, yellow, black & white together, pale blue and dark midnight blue. The symbolism is as follows. White represents the ice-covered continent, ice floes, and the edge of the Antarctic Ocean. Grey represents outcropping rocks, seals and birds. Orange represents lichen, Emperor and King penguin (head) plumage. Yellow also represents penguin plumage and the summer midnight sun. Black and white together depict penguins and whales. Pale blue represents crevasses in the ice and shallow blue icy waters of the ice shelves, whilst dark midnight blue represents the deep Antarctic Ocean and the darkness of Antarctic winter. The design is based on the geography of Antarctica. The large square of white at the centre of the sett represents the light of Antarctic summer on the ice-covered continent. This is quartered by threads of pale blue which represent the zero/360, 90, 180, and 270 lines of longitude. The point where they cross represents the South Pole. Two bands of grey surrounding this white heart depict nunataks, mountain ranges, and exposed coastal rocks. Around the coast Antarctica's life forms are found, so the colours that follow in the sett, orange, yellow, black and white, represent the wealth of animal life on the land margin and in the seas. Orange also represents the lichens that encrust the rocks. Surrounding the land pale blue and white depict the ice shelves whilst the outside is edged by thick bands of midnight blue for the ocean deeps and the dark winters. Each sett is separated by a thin band of white that represents the edge of Antarctica. Where these cross, the Southern Cross is depicted. This, viewed diagonally, also represents the Scottish saltire, - tribute to the fact that 2001 is the centenary of the first Scottish Polar expedition to the Antarctic.

MEMBERSHIP

The New Zealand Antarctic Society Inc was formed in 1933. It comprises New Zealanders and overseas friends, many of whom have been to the Antarctic and all of whom are interested in some phase of Antarctic exploration, history, development or research.

By subscribing to Antarctic annual membership of the Society entitles members to: *Antarctic* which is published each March, June, September and December. It is unique in Antarctic literature as it is the only periodical which provides regular and up to date news of the activities of all nations at work in the Antarctic and Sub-antarctic. It has worldwide circulation.

Members also receive a regular newsletter called *Polar Whispers*, an annual *Polar Log*, which records the decisions made by the Society's Council at it's AGM, catalogues of the Society's mail-order bookshop 'The Polar Bookshop' and occasional brochures from the Society's 'Sales Stall'. Occasional meetings are held by the Auckland, Wellington, Canterbury and Otago branches.

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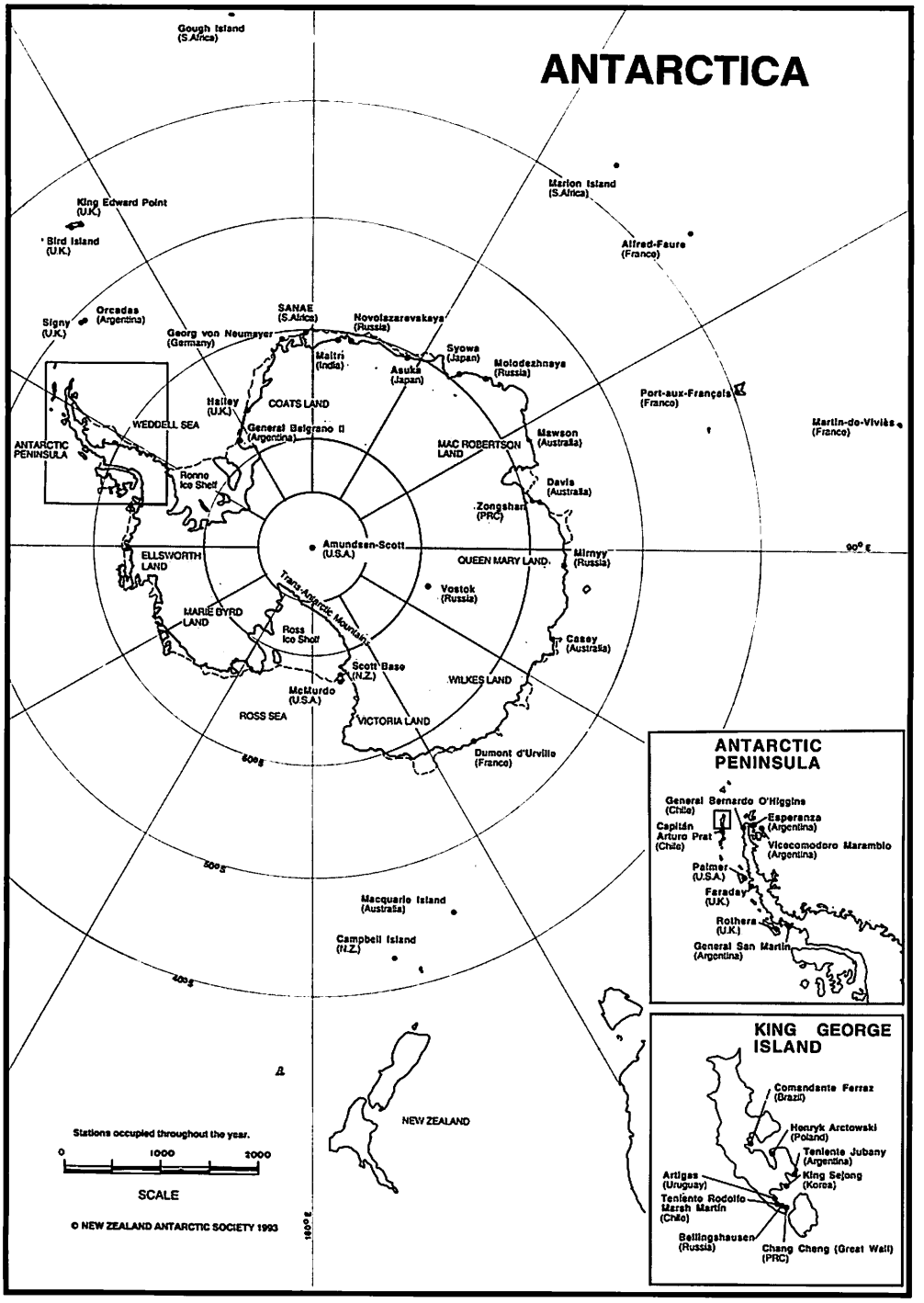
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