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Antarctica New Zealand Conference 2009

By Shulamit Gordon, Science Advisor, Antarctica New Zealand

Antarctica New Zealand has held an Annual Antarctic Conference since 2002 to bring together the various groups in New Zealand that have interests in Antarctica. As well as providing a forum for New Zealand scientists from many disciplines to present their results, the event also attracts people working in the areas of Antarctic policy, history and the arts.

The 2009 Antarctic Conference with the theme of *Sustaining the Gains of the International Polar Year* was hosted by the University of Auckland from 1 to 3 July at the impressive Owen G. Glenn building. The conference was attended by 160 registrants (55 of whom were students) with 43 oral presentations and 60 poster presentations. With the exception of the 50th Anniversary conference held in 2007, this was the most highly attended of the annual Antarctic Conferences. It is certainly encouraging to see the popularity of this event grow over the years.

In the opening session the Antarctica New Zealand Board Chair, Rob Fenwick, set the scene by outlining key strategic initiatives that the Board and management team of Antarctica New Zealand are advancing over the next four years relating to the Government's 'value for money' direction. This was followed by an eye-opening keynote talk from Martin Riddle of the Australian Antarctic Division on understanding the impacts of human activities on Antarctic coastal marine environments, based on extensive studies that the Australian Antarctic Division have undertaken over the years. Finally, Grant Avery from the State Services Commission gave a intriguing presentation on the management of complexity and risk in high risk environments using examples from the Heroic Era expeditions, more recent Antarctic experiences and the May 1996 Mt Everest climbing tragedy where nine people died.

Six of the conference's nine sessions were dedicated to research that Antarctica New Zealand supports under the science strategy sub-themes of Climate Change, The Cryosphere, The Atmosphere, The Lithosphere, Ice-Free Regions, Management and Conservation, and Marine and Terrestrial Biodiversity and Ecosystem Functioning. The presentations gave an excellent demonstration of the

Delegates being treated to a show and tell with a resident Stingray at Kelly Tarlton's Antarctic Encounter and Underwater World. Image courtesy of Kelly Tarlton's Antarctic Encounter and Underwater World

range and depth of New Zealand science undertaken in Antarctica and enabled researchers in different disciplines to hear about each other's work.

A more general session included a fascinating presentation by textile artist Clare Plug who was a 2006 Antarctic Arts Fellow. She took us through some of the art works that resulted from her visit to Antarctica and that are currently on display in her exhibition *Look South* at the Hawke's Bay Museum and Art Gallery in Napier. This was followed by a novel look by Andrew Atkin (Gateway Antarctica, University of Canterbury) into how the success of a century of Antarctic science could be reviewed using modern criteria. Finally Jim Tully, Head of the School of Political Science and Communication at the University of Canterbury and Naomi Arnold, Antarctica New Zealand's 2008/09 IPY media scholar gave an enlightening presentation on the analysis of the coverage of Antarctica in New Zealand newspapers including survey results gathered from the wider Antarctic community.

The posters presented in the conference provided an equally important perspective into the range of interests in our New Zealand Antarctic community. As well as covering all aspects of the science strategy themes, posters included several topics from the social sciences, overviews of the five programmes of the Scientific Committee of Antarctic Research (SCAR), an outline of an Antarctic data management database, and introductions to mapping resources.

Three workshops were held as part of the conference. The first was on one of Antarctica New Zealand's flagship projects, the Latitudinal Gradients Project (LGP) with updates from the project participants and an interesting presentation by the guest speaker, Martin Riddle, on an Australian-proposed project that builds on LGP concepts. The second workshop, *Taking your research further: communicating science to the wider public,* held by the Association of Polar Early Career Scientists, involved a panel of speakers giving their personal insights and useful tips on how to best communicate our science. One of the key messages given was 'If you can't sell a story about Antarctica to your audience, then you are doing something very wrong' – definitely food for thought! At the close of the conference a workshop was held to present and discuss information on the upcoming bidding round. This will allocate logistics support from Antarctica New Zealand and Antarctic science funding from the Foundation for Research, Science and Technology for a four year period starting from October 2010. As this is a relatively new linkage between the two organisations, there was much discussion about how the process would work.

No conference is complete without its social functions. An icebreaker function held at the close of the first day included the announcement of several awards. The Antarctic Youth Ambassador award was presented by Lady Pippa Blake to Natalie Meidema of Waikato University. The award, developed by Antarctica New Zealand and the Sir Peter Blake Trust, gives a young New Zealander the opportunity to contribute to environmental work in the Antarctic. Antarctic Postgraduate Research Scholarships were also awarded to five outstanding students. These scholarships are made possible through support from Helicopters New Zealand, New Zealand Post, Kelly Tarlton's Antarctic Encounter and Underwater World, the Christchurch City Council and Antarctica New Zealand. The students are studying a range of topics from contaminants in the marine environment to aspects of climate change and all will visit Antarctica this coming season.

A stunning conference dinner was generously hosted at Kelly Tarlton's Antarctic Encounter and Underwater World. Pre-dinner drinks were held in the underwater observatory where the delegates travelled on a conveyor belt and watched the marine life swim around and above them. They then enjoyed a delicious and copious three-course meal in Stingray Bay and were treated to a 'show and tell' with the resident stingray where some lucky people got to touch the stingray as it swam past.

This was a very successful conference and a fantastic opportunity to reconnect with various people in the Antarctic community and share research outcomes and ideas. In particular, there was a very strong contingent of students attending and presenting, 27 of whom had their expenses covered by the conference sponsors. These kinds of grants are vital to enable students to attend, present, make contacts, see how such conferences operate and prepare for more formal, international events. To encourage student participation, Earth Sea Sky and the New Zealand Antarctic Society generously sponsored prizes for the top four student oral and poster presentations, which were awarded at the close of the conference.

Sponsorship of this annual conference is absolutely vital for keeping costs to the participants down, covering the registration fees for students and, as mentioned above, as a means of providing student grants. Antarctica New Zealand would like to thank all the sponsors for their generous contributions and continued support of this event: University of Auckland, GNS Science, NIWA, Land Information New Zealand, Industrial Research Ltd, Ministry of Fisheries, Meridian Energy, International Antarctic Centre, GEOKEM, Kelly Tarlton's Antarctic Encounter and Underwater World, Earth Sea Sky, Royal Society of New Zealand, New Zealand Antarctic Society, Foundation for Research, Science and Technology, and the SCAR programme Evolution and Biodiversity in the Antarctic.

The 2010 conference will be hosted by the University of Canterbury from 5 to 7 July. More information on this event can be found as it becomes available on Antarctica New Zealand's website: www.antarcticanz.govt.nz

Ice loss from Pine Island Glacier, West Antarctica

Scientists at University of Leeds and University College, London have been researching Pine Island Glacier in West Antarctica and have found that it is losing ice four times as fast as it was a decade ago.

The research, published in the journal *Geophysical Research Letters*, also reveals that ice thinning is now occurring much further inland. Scientists estimate that the main section of the glacier will have disappeared in just 100 years, six times sooner than was previously thought.

The Pine Island Glacier, which is around twice the size of Scotland, is located within the most inaccessible area of Antarctica – over 1000 km from the nearest research base – and was for many years overlooked. Now, scientists have been able to track the glacier's development using continuous satellite measurements over the past 15 years. According to research co-author Professor Andrew Shepherd, the "[a]ccelerated thinning of the Pine Island Glacier [may] represent perhaps the greatest imbalance in the cryosphere today". The research has only been possible through the use of a succession of satellite instruments allowing the collection of a continuous record of measurements of the glacier. The satellites can identify both small and large changes to the glacier.

Scientists believe that the retreat of glaciers in this sector of Antarctica is caused by warming of the surrounding oceans, though it is too early to link such a trend to global warming. The 5,400 km square region of the Pine Island Glacier affected today is big enough to impact the rate at which sea levels rise around the world. Professor Shepherd considers that the manner in which the glacier will respond to the accelerated thinning is a matter of great concern because Pine Island Glacier contains enough ice to almost double the Intergovernmental Panel on Climate Change's best estimate of 21st century sea level rise.

More information can be found at http://www.leeds.ac.uk/media/press_releases/current09/glacier.htm

Photo of the Pine Island Glacier, taken by Tom Kellogg onboard the U.S. Coast Guard icebreaker Glacier, 1985

Commonwealth Women's Team Aim for the South Pole

Women from the Commonwealth countries of Brunei Darussalam, Cyprus, Ghana, India, Jamaica, Singapore, the United Kingdom and New Zealand arrived in Christchurch on 4 September to train for an international expedition to the South Pole.

The Kaspersky Lab Commonwealth Antarctic Expedition aims to highlight the work and value of the Commonwealth as it marks its 60th anniversary. The expedition is due to take place in November and if successful will achieve several world firsts, including the first woman from New Zealand to ski to the South Pole. The team members from Brunei, Cyprus, Ghana and Jamaica will be the first people from their country to ski to the South Pole, while the team members from Singapore, India and New Zealand will be the first women from their nations to do so.

The team member representing New Zealand is 34-year-old Charmaine Tate, an Army Doctor from Auckland. Ms Tate was selected from over 200 New Zealand applicants to join the team. She says, "I feel kind of humbled and privileged to be representing my country. I hope that I do justice to the choice and I intend to work hard, train hard and contribute."

Travelling south from Christchurch over the weekend, the team were based in Twizel for three or four days to sort equipment and rations before heading to Wanaka and embarking on a training-expedition in the Pisa Range with full Antarctic kit. During the 40-day, 900 km ski to the South Pole the team must be prepared for temperatures down to -40° C, gale force winds and deadly crevasses. If all goes well, they are due to arrive at the South Pole on New Year's Day 2010.

Many of the chosen team members had no previous expedition or cold-weather experience, making this challenge even more remarkable. The team has been selected and trained by expedition leader Felicity Aston, 31, from the UK who has led several successful polar expeditions. She says, "The training we plan to complete in New Zealand is vital to the success of the expedition and is our last chance to get ourselves fully prepared before departing for Antarctica in November. It's particularly good to be in New Zealand because of the close connection it has with Antarctica and the affection people have here for the continent on their doorstep." More information on the expedition can be found at www.commonwealthexpedition.com

Farming the Stars: South Pole Gardening and Spaceflight

By Joseph F. Romagnano

Remote, cold, harsh, dark, isolated, extreme…
These words describe two remarkable environments: the South Pole and Space.

Bob Dragonfly and Robert Fuhrmann help to bring in a large crop of Japanese Mizuna on 10 May 2009.

Photograph by Joseph Romagnano

Harvest time allows the crew to come together as a community to bring in their crop of "freshies", the term used for highly-prized fresh vegetables. Indeed, nothing increases crew morale like the arrival of a new crop.

Some of the adopt-a-croppers for this year. Standing from left: Jude Gregan (peas), Joseph Smith (strawberries), Ella Derbyshire (carrots), Nathan Greenland (pollination), Erin Wilkinson (spinach). Seated from left: Laurie Brekke (peas, beans), Emily Wampler (flowers), Genevieve Ellison (eggplant). Photograph by Joseph Romagnano

There are very few other places on Earth that can serve as such a remarkable testing analog for long duration spaceflight. The South Pole Food Growth Chamber, or "The Greenhouse", is an outstanding facility capable of providing not only fresh fruits and vegetables to the winter-over crews of Amundsen-Scott South Pole Station but also valuable insights and data that will lay the foundation for the eventual colonisation of the Moon, Mars and beyond.

Almost since the inception of their space programmes both NASA and Roscosmos (Russian Federal Space Agency) committed research efforts towards the development of Advanced Life Support (ALS) systems capable of providing for astronauts over long duration missions. For example, the trip to Mars has often been called "the 1000 day mission." This reflects the time it would take for a crew to make it to Mars, perform research, and return. Plant life forms a key component of the advanced life support system. In addition to providing fresh food for the crew, plants also perform many functions vital for life support. Through the process of photosynthesis plants provide, pound-for-pound, more oxygen than simply hauling along liquid oxygen. There is also the added benefit of carbon dioxide capture. Transpiration provides water purification through which grey-water can be reclaimed and reused. When excess biomass is decomposed the methane released can be used as fuel to power rocket engines.

The Greenhouse also provides important psychological benefits to the winter-over crew. Although winter-over "Polies" are isolated for little over a quarter of the hypothetical "1000 day" time, the deprivation of sunlight, the isolation and the harsh environment give more than just a small taste of what the "1000 day mission" would be like. Sponsored by Roscosmos, a crew of six men recently completed a 105-day simulated Mars mission at a facility in Moscow, Russia. This test included simulations of launch, interplanetary cruise, surface landing and ascent followed by a return cruise and landing. Along the way various emergency scenarios challenged the crew. An additional 20 minute delay in communications was imposed to simulate distance-imposed time delay between Earth and Mars.

Year after year since 1957 Antarctic winter-over crews have spent more time in isolation and darkness than the recent Mars mission simulation. Before the advent of satellite communications at the Pole, winter-over crew members would often use Ham radio to communicate, when possible, with the outside world. Even now off-continent communication is restricted to times when satellites are visible or radio transmissions can propagate. Crews also spend time training for emergency events ranging from lost crew to a catastrophic loss of the station. In both scenarios plants have provided a source of stress relief and a comforting reminder of the world left behind. Anecdotal stories abound throughout the space programmes about astronauts not wanting to terminate experiments involving plants because they were felt to be "part of the crew". In the recent Mars simulation the crew grew orchids. Here at the Pole we have the Greenhouse.

The Greenhouse is an oasis of heat, humidity, light, life and colour amidst the sterile industrial environment throughout the rest of the station. It is a place for members of the crew to relax and unwind after a long hard day out on the polar plateau. There are places for crew to stretch out on a couch and read a favourite book, carry on conversations with friends, call home or even surf the internet. Harvest time allows the crew to come together as a community to bring in their crop of "freshies", the term used for highly-prized fresh vegetables. Indeed, nothing increases crew morale like the arrival of a new crop. That said, it is very important that a variety of cultivars and crop types are grown so that the crew does not become bored and tired of the crops grown.

Continued over ▶▶

Harvesting sweet red capsicums for the mid-winter dinner. Photograph by Jude Gregan

The Greenhouse packed full of freshies for mid-winter dinner. Photograph by Joseph Romagnano

A recent crew survey demonstrated that a little over 15% of the crew desired less lettuce from the Greenhouse. This was a surprise since lettuce is precisely the crop that the Greenhouse was designed to grow. Several other leafy green crops were also marked as less desirable. What these results highlighted is that even in an environment of scarcity it is still possible to have too much of a good thing. Therefore the Greenhouse caretakers work diligently to ensure that a variety of useable crops are maintained. If they are successful then crew requirements are met while still sustaining a useful production rate.

The Greenhouse crops can be divided into five basic categories: fruits, vegetative, leafy greens, herbs and flowers/ornamental. Fruit crops include such items as cherry tomatoes, strawberries, peppers and cantaloupes. The newest addition to the chamber is two vertical columns designed to greatly increase our strawberry production. The strawberry columns serve as a perfect example of the Greenhouse to bring people together; no less than seven different departments contributed to the installation of the strawberry columns. Vegetative crops include items such as cucumbers, sugar peas, carrots, and radishes. Our current crop of carrots is growing in a plastic-lined box filled with vermiculite and rockwool (limestone heated to 2500° F, spun into threads like cotton candy and then pressed into moulds) chunks, another example of South Pole innovation. Leafy greens include various types of red and green loose-head lettuce, arugula, spinach, mustard greens, pac choi and Japanese mizuna. These crops are either harvested whole when ready or leaf-harvested over the course of several months. Japanese mizuna is also a crop currently grown by the Russians in their LADA growth chamber at the International Space Station. Some of the pickiest crops are the herbs such as cilantro, basil, chives, parsley and dill. These crops are often grown for multiple harvests and care must be taken to keep them from going to seed or growing past their useful life stage. The Antarctic Treaty requires that only edible crops may be grown in the Greenhouse, however there are many wonderful flowering and ornamental crops that are also quite edible. These include sunflowers, nasturtiums, marigolds and geraniums. All of these have edible flowers, greens, or seeds and provide a lovely splash of colour in the Greenhouse. The variety of crops is a true reflection of the diversity of people in the community who help with crop maintenance and harvesting.

This winter there are 43 people living here at the Amundsen-Scott South Pole Station. The last flight left in mid-February and the next flight won't return until late October. We are both scientists and support personnel, working under the auspices of the United States Antarctic Program sponsored by the National Science Foundation. This is quite a large community of people who directly interact with and support the Greenhouse operations. For example, the adopt-a-crop programme allows crew members to choose a crop and grow it from seed-to-feed. Participants take a great deal of pride that it is their tomatoes or their peas that are on the table; to date, almost 50% of the crew have participated in the programme. There is also a large group of people who repeatedly show up to harvest, ready and willing to help out. Finally, there are off-site advisors at the University of Arizona who serve a vital role analogous to Mission Control. Without the support of these individuals, the Greenhouse simply would not function. It would also be impossible to collect the data which is most useful for ALS purposes.

In addition to the weekly biomass harvested there are a number of other parameters measured that help maintain the chamber. These include pH, electrical conductivity, humidity, temperature, light levels, condensate rate formation, CO_2 use and nutrient solution flow rates. These allow us to

Visible are spinach, arugula, mint, radish, lettuce, chives, basil, pepper and tomato plants.

Adopt-a-cropper Emily Wampler shows off the first small flower from her nasturtium plants. Photograph by Joseph Romagnano

determine how much energy is expended per unit biomass, the nutrient uptake rate, rate of water purification, and rate of oxygen formation; all of this from one 200 square foot area. So far this season over 900 lbs of freshies from over 30 crop cultivars have been grown in the Greenhouse. These 900 lbs were grown from a seed supply that weighs less than 5 lbs: a return of more than 180 times the initial investment in mass! In an environment where every pound of transport is a substantial cost, crop plants from seed clearly pull their weight!

From tall pepper plants that almost hit the ceiling to short and flat lettuce and endive, every plant in the South Pole Greenhouse starts out as a tiny seed. Special trays are lined with a thick layer of paper towels. The towels are moistened and seeds for various crops are placed on top of the towels and then covered over with a single moistened layer of paper towel. The seeded trays are placed in a special cabinet located in the outer-room (known as the "environmental room") of the Greenhouse. The cabinet has a high humidity that prevents the seeds from drying out while the environmental room provides a steady temperature. After anywhere from two to 10 days (depending on seed size and crop type) the newly germinated seedlings are either transplanted into rockwool cubes and placed into a main system tray or transplanted directly into a main system.

The main Greenhouse is divided into three sections: two consist of multiple racks of interchangeable trays that have a thin film of nutrient solution flowing along the bottom; the other system consists of large tubs where a deep flow of nutrient solution is possible. The interchangeable racks are designed for small quick-turnover crops such as lettuce. The deep-flow system is designed for large long-term plants such as peppers, tomatoes and cucumbers. The photoperiod is 13 hours and the light level simulates a long summer afternoon. The temperature is also regulated to cycle with the photoperiod.

Crops can be harvested in as little as 14 days depending on type and position within the chamber. Some of our long term crops have lasted as long as seven months with multiple harvests. At harvest time the crop is removed from the system, excess biomass is removed and disposed (roots, bad-looking leaves, stems, etc.), the desired biomass is bagged, weighed and then taken to the galley for storage and use. For leaf crops such as lettuce and spinach the galley chefs wash the leaves with a vinegar solution in a straining basket. The leaves, perhaps with some cherry tomatoes and peas are mixed together and a nice fresh salad is available to the community.

One final aspect of Greenhouse operations which is of great use for ALS planners are the lessons we have learned for supply logistics. When materials run out mid-winter, that's it, there will be no resupply until the planes start to fly again. Similarly, if a critical component cannot be replaced and you are three-quarters of the way into your mission to Mars, you are out of luck. It is vital to learn which components are critical, and fail often, and which are the long-shots. Items such as lamps and ballasts are critical for system operation and they fail fairly frequently. On the other hand, a fuse buried deep in the control circuitry may not fail as often, but it is equally critical to have present. Rates of consumables consumption and a margin for error are also key parameters to establish well before the doors are closed.

Slowly but surely we have gained experience in all of these key areas. Old methods are replaced as new ones are developed thus streamlining the whole operation. New and unexpected challenges arise and direct our attention to areas previously considered unimportant. With each season completed we are one step closer to that ultimate goal; existence in a completely alien environment. After all, Antarctica is still planet Earth even if it is at the door of space.

Star-gazing at 90° below – Looking Up at the South Pole *Part One*

By Ella Derbyshire

The South Pole stars are magnificent. I am accustomed to observing the night sky from the north mid-latitudes, and from above the Arctic Circle. After decades of looking up, I know those skies rather well. I came here to South Pole expecting an alien sky and had a wish list of things to see before I returned to the north. The night sky from the South Pole has easily surpassed all of my expectations, and my stellar wishes have all come true.

If you think about it, the South Pole is one of the simplest of all skies on Earth to understand. The weather and its impact on star-gazing are remarkably predictable. The star field changes very little from day to day. The movements of the sun and the moon in the sky are startlingly simple, but there are small diversions to amuse those who venture outside for the sole purpose of looking at stars. There are some unusual aspects to star-gazing here, but those who take the time to look up at the stars of the south celestial hemisphere are well-rewarded.

The Weather

It is always cold here, but some days are much colder than others. If the thermometer says -40° C, then it is a warm winter day at the South Pole. You might think that warm weather would be welcome to star-gazers, but warm days are not at all good days for watching the stars. That is because warm weather always arrives on the wind, and the wind stirs up fine particles of snow. So, warm winter days bring snow-filled, starless skies.

I saw the darkest, clearest skies this winter on cold, moonless days between the beginning of May and the end of July. The sun was far enough below the horizon to leave no telltale glow, and the air was calm and crystal clear. The thermometer would say -70° C, and my time under the starry dome was limited by my ability to stand still in the cold; but such extremely frigid nights always delivered a sky full of stars and other celestial delights.

The extreme cold of a clear night under the stars presents problems for the observer at the South Pole. I prepare for my star-gazing excursions by donning my extreme cold weather gear, adding extra layers of clothing, including multiple pairs of socks and gloves to keep toes and fingers warm for

Blue line drawing of South Pole constellations from the Pole to about 45°

Scorpius, Sagitarius and Aurora seen June 25th 2009. Photograph by J Johnson

as long as possible. If it is a really cold night, and I know that I will want to be outside for a long time, I add chemical hand and foot warmers. A hat or two, one or two neck gaiters and a pair of blue boots complete the outfit, and then I'm ready for going outside under the stars.

After a time that seldom exceeds an hour, the cold forces me back into the station. I can stay out longer if I keep moving, but it is difficult to look through binoculars while walking on the dark, sastrugi-strewn landscape, and I do love to look at the South Pole sky through binoculars. So, on clear observing nights I plan for short multiple visits with the southern constellations.

Cold is a problem for amateur astronomers, not only because we get uncomfortable and risk frostbite, but also because our gear doesn't like the cold either. We always carry radios when we go outside; everyone, no matter how short a time they plan to be outdoors, has a radio with them. In the cold, radio batteries don't stay charged for very long, and the warning beep of a dying battery means that it is time to come inside while the radio is still sending and receiving. We can change to a fresh battery and return to the night sky while we recharge the cold one. Once the buttons start to freeze, it takes a while to thaw out the radio, and the observing session ends. Camera batteries likewise die quickly in the cold. I shoot panoramas, and it is not uncommon to run out of charge after shooting 20 images, or halfway through a panorama. I used to carry extra batteries outside for the radio and the camera, but to change to fresh batteries I needed to remove some layers of gloves. Once a glove came off, I couldn't rewarm the hand, and so I have learned to just come inside to change batteries and to warm up before the next trip outside.

Long hours in extreme cold had an unexpected effect on my camera. I started to see oddly placed green and blue stars in my photographs. Even stranger, the brightly coloured stars were in all of my night shots, not just my photographs of stars. Asking South Pole's other outdoor photographers about my problem revealed I was not the only one with phantom stars, and that I did not have the worst case. And that is how I found out that extreme cold damages the CCDs in digital cameras, and that the phantom stars are lost pixels of information.

To malfunction in extreme cold a device doesn't have to have batteries. After a few minutes of looking up, the glass eyepieces of my binoculars frost over. My camera has a similar problem, frosting from breath or just from looking through the viewfinder. Straps on binoculars get brittle and break. The pan heads on tripods freeze, and the legs lock in place. Forcing the issue breaks equipment, and so the remedy for most of these problems is a trip inside to rewarm both the star-gazer and the gear.

Continued over ▶▶

Orienting at the Bottom of the World

It took me a while to decipher the grid system at the Pole. It seemed obvious that from here, every other place on Earth is north, and so statements about a southerly wind or a plane approaching from the west didn't make a lot of sense to me. Checking charts and maps and asking around the station gleaned some valuable information. "North" here is grid north, which faces 0° longitude, and points in the direction of Greenwich, England. The front of the elevated station faces in the general direction of grid north. Grid south is 180° west longitude, and toward the antimeridian, past the berms behind the station. Grid south points in the general direction of McMurdo Station and New Zealand. Grid west faces 90° longitude, and that is the view from the observation deck at Destination Alpha, the station entrance nearest the runway. North and South America and the Antarctic Peninsula are far off in that general direction. Grid east is 90° east longitude, and extends beyond the Dome to Central Asia.

The process of finding stars here is almost the same as that from anywhere else on Planet Earth. Right ascension is still the sky's equivalent to longitude, and it is still measured in hours and minutes, but here the imaginary lines of right ascension converge in the sky at the South Celestial Pole, which is directly overhead. The eastern edge of Aquarius is near 0 hours right ascension (R.A.). 6h R.A. runs up the sky between two bright stars: Rigel in Orion and Sirius in Canis Major. 12h R.A. lies between Corvus and Crater, and 18h R.A. runs through Serpens Cauda and the eastern part of Ophiuchus. Declination is the sky's equivalent to latitude, but at the South Pole, a star's declination actually tells me the altitude of the star above the horizon. Mintaka's declination of 0° 18' places it very near to the celestial equator, and so it appears almost exactly on our horizon. If a star or a planet, the Sun or the Moon, have positive declinations, they are absent from our South Pole sky.

It is much easier to aim a telescope at a star if you know the star's coordinates, but I am an amateur astronomer at the South Pole without a telescope. With either naked-eye viewing or using binoculars, I have found it easier to find objects by star-hopping through constellations than by using celestial coordinates and South Pole's grid coordinates.

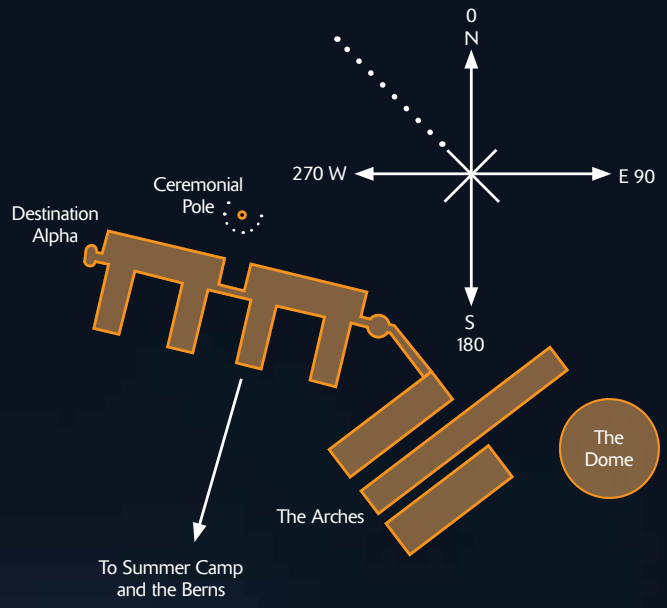
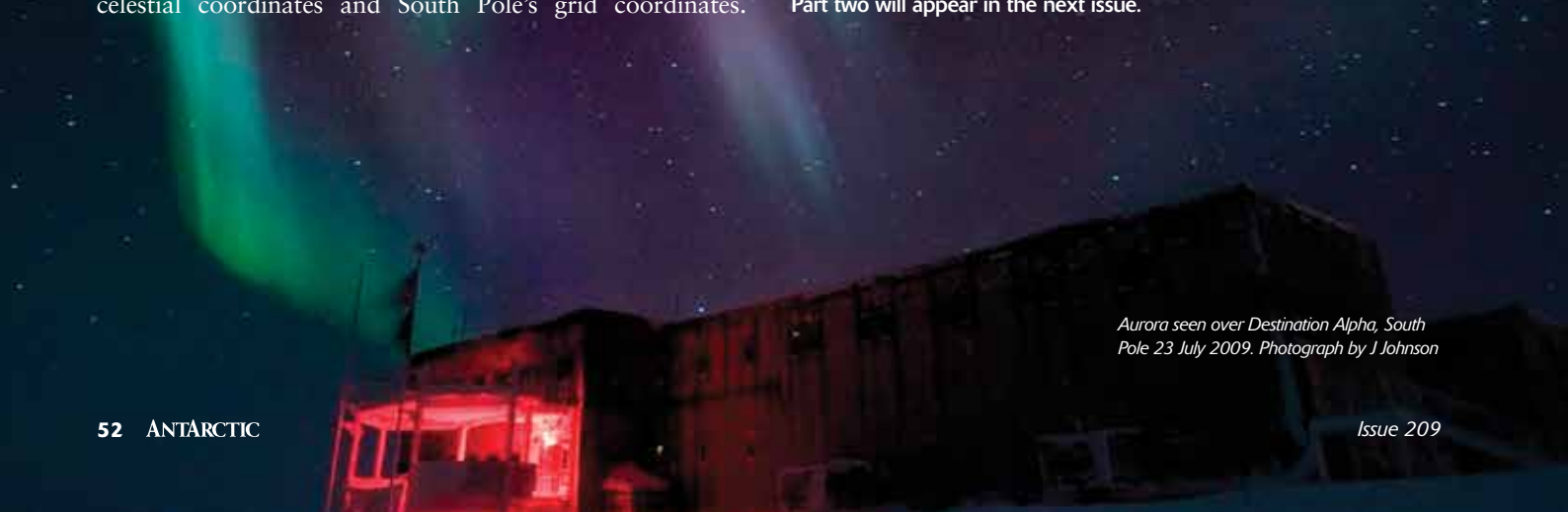


Diagram showing the orientation of the South Pole elevated station.

I think that familiarity with the star patterns comes quite quickly here because the stars remain almost fixed in the constantly turning sky. Yes, the starry sky spins completely around once every 24 hours, and the stars do shift westward by the usual 4° each day, but their altitude doesn't change, nor do their positions relative to each other.

At first I saw only unfamiliar stars moving across the sky from right to left, and it required some serious effort to adjust to the situation. Even constellations from the southern horizon of the Alaskan sky that are familiar to me look different when they are hung upside down and moving in an unaccustomed direction over the horizon. The stars of Scorpius and Canis Major, both of them familiar denizens of the northern sky, were my first guideposts in the south. I spent a few weeks of leisure time outside with my guide books held upside in the red light of my headlamp trying to organise and memorise this new sky. With all of the dark hours of an Antarctic winter, the sky was ready for viewing regardless of the time of day. In a surprisingly short time, I was finding my way among the stars.

Part two will appear in the next issue.



Aurora seen over Destination Alpha, South Pole 23 July 2009. Photograph by J Johnson

Working on "The Rock"

At the very south of the Chatham Islands facing the emptiness of the Southern Ocean with nothing between it and the Antarctic continent, lies The Pyramid, perhaps the most evocatively named of all New Zealand's offshore islands.

By R. Paul Scofield
Vertebrate Curator, Canterbury Museum

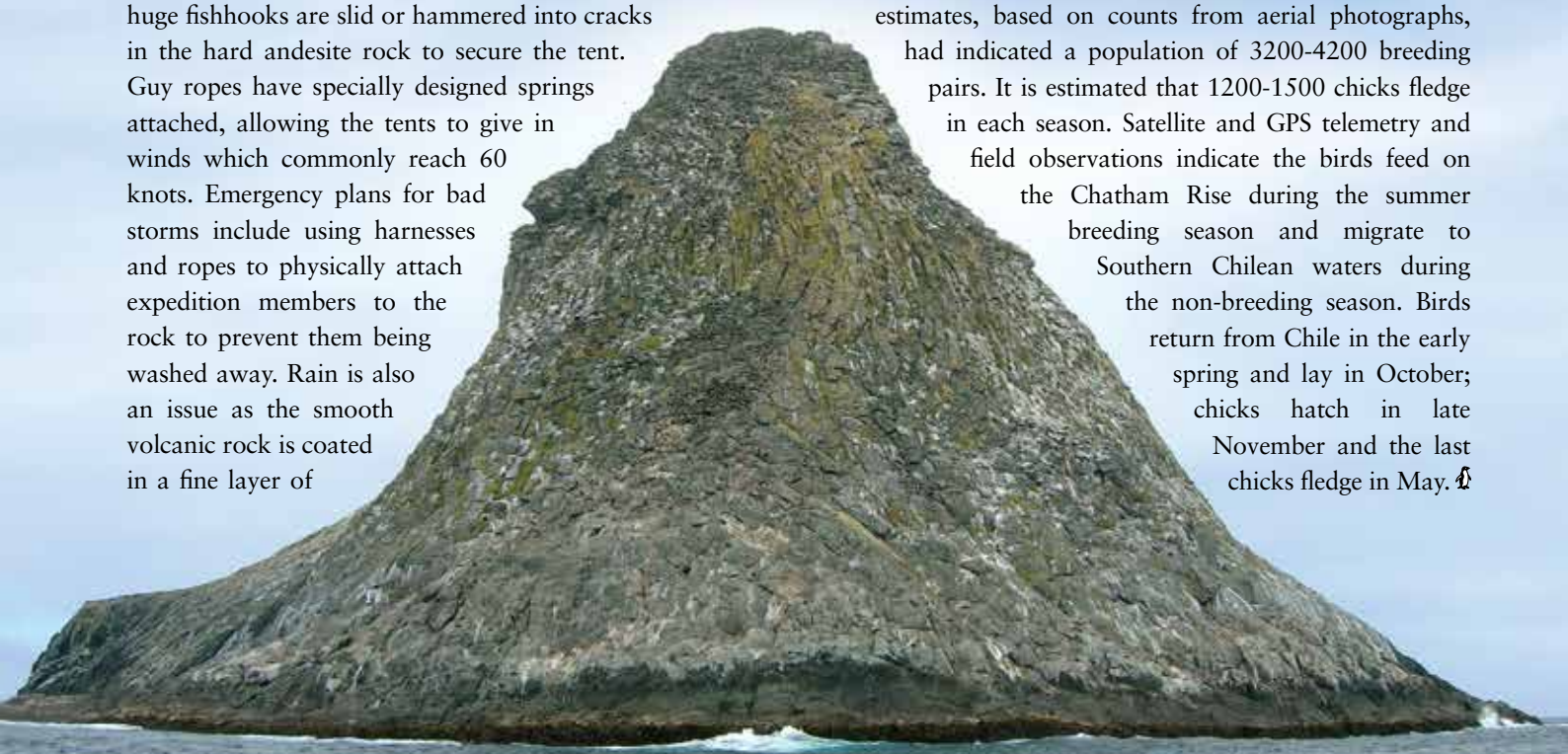
Its precipitous, virtually inaccessible 1.7 hectares are the only home to the rarest New Zealand's albatross, the Chatham Mollymawk. The island's most prominent features are a small shelf 30 metres above sea level on the south-east and a shallow cave with a huge mouth on the western face. Work by biologists on the Chatham Mollymawk began in the 1970s by Chris Robertson of the Wildlife Service of the Department of Internal Affairs. Annual visits by Robertson began in 1998 and later continued by the author, when the species was identified as a small but regular part of fisheries by-catch on the Chatham Rise.

Field trips to The Pyramid are not undertaken lightly. Landing is treacherous across kelp-covered rocks constantly washed by two metre swells. The continuous barrage of weather fronts assailing the Chathams mean that it is generally only possible to access the island on one or two days per month. Sometimes the weather patterns are atrocious for long periods resulting in field trips being abandoned due to the inability to get ashore.

Life ashore is not simple as there is only one place, on the south-east side, flat enough to camp on uneven, mostly horizontal, ground. Due to the lack of soil, pitons and huge fishhooks are slid or hammered into cracks in the hard andesite rock to secure the tent. Guy ropes have specially designed springs attached, allowing the tents to give in winds which commonly reach 60 knots. Emergency plans for bad storms include using harnesses and ropes to physically attach expedition members to the rock to prevent them being washed away. Rain is also an issue as the smooth volcanic rock is coated in a fine layer of guano that becomes incredibly slippery with the slightest dampness, making movement on the steep slope impossible and confining workers to camp.

Chatham Mollymawk. Photograph by Paul Scofield

On dry days, with the aid of a rope, there are very few Chatham Mollymawk nest sites that can't be visited by trained rock-climbers. Three cohorts of chicks banded in the early 1990s and a proportion of nests are monitored each season to establish adult survival and fecundity. Between 1999 and 2007 there have been between 5200 and 5333 occupied breeding sites each season, suggesting a probable breeding population of 10,000-11,000 individuals. Previous estimates, based on counts from aerial photographs, had indicated a population of 3200-4200 breeding pairs. It is estimated that 1200-1500 chicks fledge in each season. Satellite and GPS telemetry and field observations indicate the birds feed on the Chatham Rise during the summer breeding season and migrate to Southern Chilean waters during the non-breeding season. Birds return from Chile in the early spring and lay in October; chicks hatch in late November and the last chicks fledge in May.



The Pyramid. Photograph by Paul Scofield

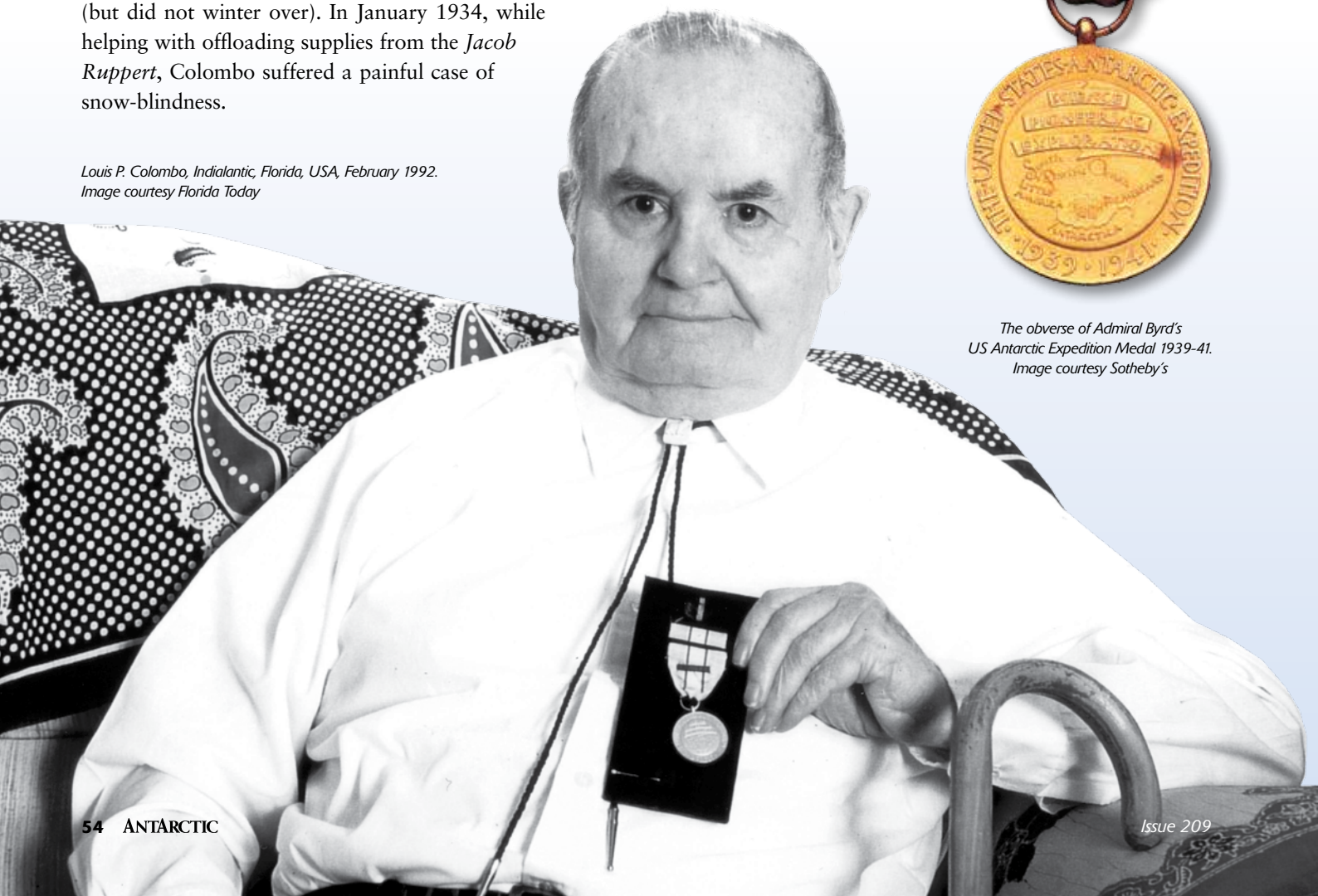
Medallic Whispers of a Dog Sledge Driver: Louis P. Colombo and his US Antarctic Expedition Medal, 1939-41

By Glenn M. Stein, FRGS

Well after the British-dominated Heroic Age of Antarctic Exploration, Richard E. Byrd carried the Stars and Stripes into the Southern Ocean, first reaching the Ross Ice Shelf near the end of the third decade of the 20th century. Two more expeditions followed, earning Byrd a place in Antarctic history for his systematic development of using aircraft and aerial photography, two-way radio communication with the outside world, and the successful use of motorised tracked vehicles.

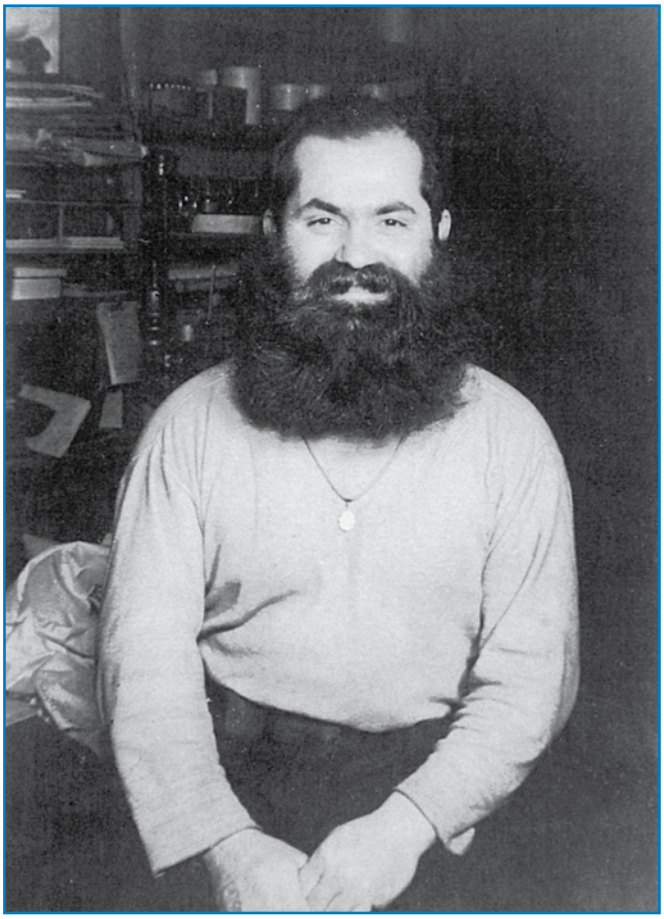
Though the Americans were at the forefront of what some call Antarctica's Mechanised Age, the trusty canine was still the locomotive mainstay for Antarctic explorers – and remained so for many years. Revealed here is a seldom seen glimpse behind an American Antarctic medal to one of Byrd's dog sledge drivers, who embodied the spirit of pre-World War II polar exploration right up until the present day.

As a merchant seaman in the early 1930s, Louis Patrick Colombo was a seaman and fireman on the *Jacob Ruppert* during her two voyages to Antarctica through 1933-1935, and also acted as an assistant mechanic to the Ice Party (but did not winter over). In January 1934, while helping with offloading supplies from the *Jacob Ruppert*, Colombo suffered a painful case of snow-blindness.



Louis P. Colombo, Indialantic, Florida, USA, February 1992. Image courtesy Florida Today

The obverse of Admiral Byrd's US Antarctic Expedition Medal 1939-41. Image courtesy Sotheby's



Louis P. Colombo during the USAS Expedition, 1939-41.
Image courtesy Robert L Colombo

Without being attached to the Ice Party, Colombo was not entitled to the medal for Byrd's second expedition, but he must have felt otherwise, as a 1948 watercolour portrait in his Army uniform shows him wearing the 1933-1935 ribbon bar after that of the 1939-1941 medal. Interestingly, another portrait photograph of Colombo in uniform of the same period features only the latter ribbon, and thus hints of an "official correction".

In 1939, Congress established the US Antarctic Service (USAS), and an expedition under Byrd was sent south "to consolidate previous American exploration and to examine more closely the land in the Pacific sector". East Base and West Base were organised (with Colombo serving as a dog sledge driver and supply man at the latter), and a range of scientific studies were carried out. Due to rising international tensions, both bases were evacuated by March 1941. This was the first expedition to the region to bring back colour photographs.

Congress established the US Antarctic Expedition Medal 1939-41 on 24 September 1945, with three levels: gold (10 kt gold plated over copper alloy, satin finished with burnished highlights); sterling silver (oxidized), relieved and satin finish; and bronze (red brass, oxidized dark gray, giving a pale greenish-gold colour), relieved and satin finish. Byrd's medal is said to have been a unique issue in genuine gold, but is not marked as such.

The obverse centre of the medal features a globe viewed from an angle below, showing Antarctica surrounded by the following in very small lettering: "South Pacific Ocean, Antarctica, Little America, Palmerland" and "South Pole" Above, on a three-level ribbon is: "science, pioneering, exploration". Encircling the globe are the words, "The United States Antarctic Expedition 1939 1941." The entire reverse is filled by the following inscription: "By Act of the Congress of the United States of America to [recipient's name] in recognition of the invaluable service to the nation by courageous pioneering in polar exploration which resulted in important geographical and scientific discoveries". The recipient's name was engraved on the reverse in large and medium serifed capitals, and when initially issued, the medal may have been contained in named cases.

The years after Colombo returned from the Frozen Continent for the last time continued to be filled with cold and ice but at the other end of the world. Embarking on an Army career (with his polar experience known to commanders) Colombo was sent to a secret weather and radio outpost on Baffin Island (in the Canadian Arctic archipelago), taught cold weather survival and served on Greenland's icecap. He was afterwards ordered to Belgium as a rescue unit specialist during the Battle of the Bulge, though the fighting had run its course by the time of his arrival.

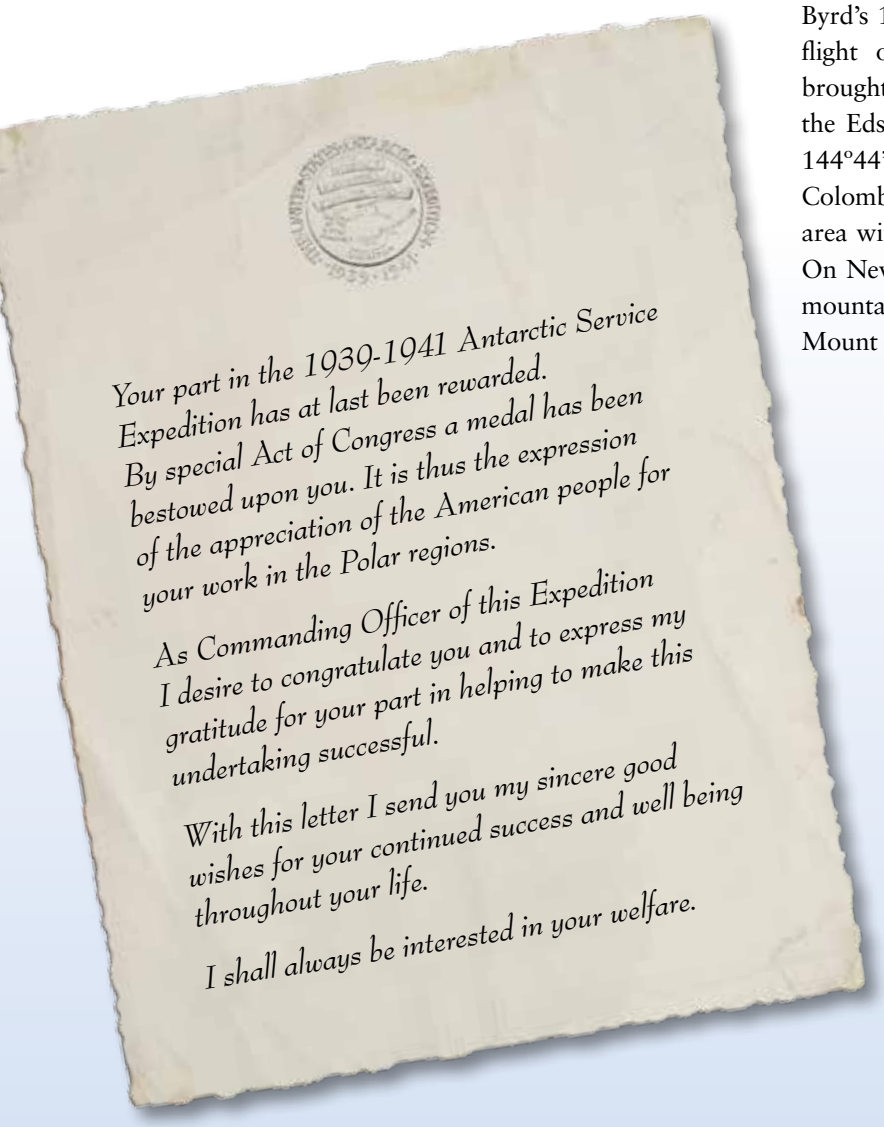
Colombo passed away in October 1995, in his 84th year, but ensured the treasured mementos from his polar adventures were eventually placed in the care of his nephew, Bob Colombo, whom I visited. The collection included two stately stuffed penguins, photographs, documents and letters and the polar medal.

Continued over ▶▶

Unloading the Jacob Ruppert, *during the 1933-35 expedition.*
Photograph by John Dyer, Chief Radio Engineer

Colombo's gold medal was stored in its 1950s-era plastic award case along with a faded ribbon bar, lapel pin and a much-worn lapel rosette. Deeply engraved on the medal's reverse was: "Louis P. Colombo". It hung from a faded ribbon, and at some point, Colombo had affixed a miniature bronze "Wintered over" clasp to it, identical to one normally seen on a miniature US Antarctic Service Medal (established 1960). *This* dog sledge driver was indeed proud of his service!

The medal rested upon a plush dark blue pad which seemed to ride a bit high in the case indicating that there was something underneath. Upon lifting the pad an ample reward was revealed including: Colombo's Social Security card (issued during service at the Army's Alaskan Arctic Indoctrination School), and two neatly folded letters, one of which was frail and yellowish-brown with age. Both letters were from Byrd and related to the issuance of the medal. The first letter gave options for Colombo to choose how the medal would be presented to him. The other letter, signed by Richard Byrd was undated and announced the medal's approval:



Your part in the 1939-1941 Antarctic Service Expedition has at last been rewarded. By special Act of Congress a medal has been bestowed upon you. It is thus the expression of the appreciation of the American people for your work in the Polar regions.

As Commanding Officer of this Expedition I desire to congratulate you and to express my gratitude for your part in helping to make this undertaking successful.

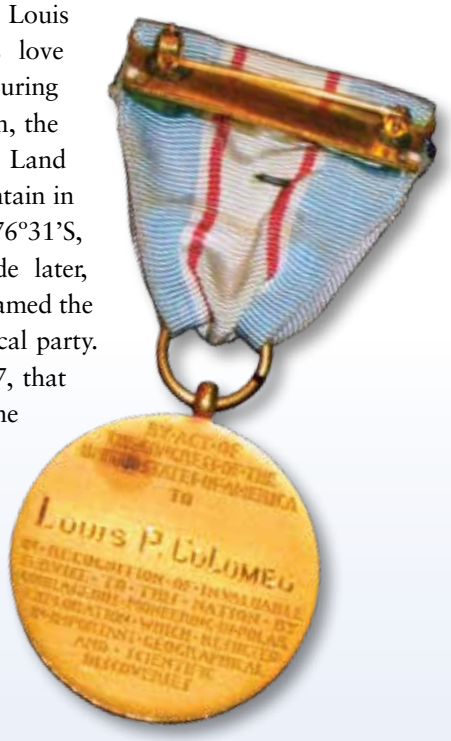
With this letter I send you my sincere good wishes for your continued success and well being throughout your life.

I shall always be interested in your welfare.

Under the lining of the medal case was stored a pristine length of spare ribbon. Until my visit and this discovery Bob Colombo had had no idea of the existence of the additional items.

According to the papers of Admiral Richard E. Byrd, held at The Ohio State University Archives, Colombo received his medal from the commanding general of the 9th Infantry Division, at Fort Dix, New Jersey. The front page of Fifth Corps' newspaper, *The Guardian*, announced on 8 January 1954: "Navy Decorates Cold Weather Expert". An accompanying photograph showed Master Sergeant Louis Colombo (373rd Armoured Infantry Battalion, Wildflecken, West Germany), having the medal pinned on him by the battalion commander, Lieutenant Colonel William N. Colyer. Between the newspaper report and the 1950s-era plastic award case, the 1954 presentation has solid support. For some reason, the intended Fort Dix presentation was never carried out.

Dog sledge driver Louis Colombo never lost his love of the Polar Regions. During Byrd's 1928-30 expedition, the flight over Marie Byrd Land brought into view a mountain in the Edsel Ford Ranges (76°31'S, 144°44'W), and a decade later, Colombo and his dogs roamed the area with a USAS biological party. On New Year's Day 1947, that mountain officially became Mount Colombo.



The reverse of Colombo's US Antarctic Expedition Medal 1939-41. Image courtesy Robert L Colombo

Acknowledgements

Mr. Joseph Colombo
Mr. Robert L. Colombo
Mr. Robert P. Colombo Jr.
Ms. Leilani Rashida Henry
Ms. Laura J. Kissel

References are available from the author on request

The Power of Poetry III

This poem by Siobhan Collins was inspired by a cigar box on display in the Antarctic Gallery at Canterbury Museum.

This gentleman's treat is a little symbol of civilisation, like the books and the phonograph and the fine china that Scott took South with him. There is a gently teasing tone in this poem where immortality is somehow domestic, as bright as Havana sunlight, as cheerful as enthusiastic applause.

Siobhan is a student from the Hagley Writers' Institute, established in 2008 in Christchurch. Morrin Rout is the director of the Institute; the tutors are well known local writers, Fiona Farrell and Bernadette Hall. Four poems from students in this course were exhibited in the Antarctic Gallery at the museum in 2008.

The Cigar Box

By Siobhan Collins

Days in the sun dance on the lid.
The seal's unbroken through the glass.
The finest box of SOL cigars
donated 'For The Final Dash.'
I like to think that as ice edged
the fragile marrow from your bones,
and packed the space.
In that last hypothermic high
you stood in hot Havana sun
in navy wool, gold brass and braid.
Popped the seal and flamed the match,
and drifting on the fragrant smoke,
fell back into an endless accolade.

Tin of Havanah 25 Perfectos Elegantes Sol cigars – unopened, with the following inscription "For the final dash, compliments"
Canterbury Museum 1967.128.22

Treasures From Canterbury Museum: Arthur Beaumont

By Natalie Cadenhead

Carefully tucked away in a store at Canterbury Museum is a folder containing a single watercolour painting of two ships surrounded by icebergs and penguins by icebergs and penguins (1992.135.1). The signature on the lower right corner is that of Arthur Beaumont, with a date of 1960.

Arthur Beaumont né Athur Edwin Crabbe was born in England on March 25, 1890, son of Moses Samuel Crabbe and Sarah Jane Belderson. Initially taught by his mother, he was interested in art and drawing from an early age. On completion of his college studies in 1907 he decided, at age 19 to emigrate to the US via Canada where he worked on a cattle ranch in Saskatchewan. While there he developed his drawing skills by sketching life on a ranch and later used these as the basis for impressionist-style paintings. From 1908 until 1917 he had a series of adventures including studying at the San Francisco Institute of Art; working on a ranch in Oregon where he caught and survived typhoid fever; and working in a power plant in the High Sierras before returning to ranch work in the San Joaquin Valley where he became known as "Bronco Pete" for his riding skills. While there he uncovered a cattle rusting ring and informed the authorities. The rustlers retaliated by attacking him, causing serious injuries. Although the rustlers were convicted

Crabbe moved to San Francisco to prevent further attacks on him. Around 1915, soon after this incident, "Bronco Pete" changed his name to Arthur Edwaine Beaumont-Crabbe and then dropped the Crabbe, officially changing his name to Arthur Edwaine Beaumont.

He continued to change jobs regularly, and to sketch the places and adventures he experienced along the way. When working in Los Angeles as a construction worker for the Bible Institute, he met his future wife Dorothy Dean. In 1917 Beau, as he was now known, opened a commercial art studio and after two years had had enough success to marry Dorothy in April 1919. Over the next few years he pursued art with vigour, studying at the Los Angeles School of Art and Design and then the Chouinard School of Art. In 1925 he accepted a scholarship to study in Europe and leaving his family behind he enrolled at the Slade School of Art at the University of London where he specialised in portraiture with additional training in mural and water-colour painting, lithography, etching, and sculpture. Here his interest in Antarctica was piqued when he met Roald Amundsen at the Savage Club where he was living.

Painting at the Pole was problematic due to the cold however he overcame this by wearing several pairs of gloves and mixing torpedo alcohol into his paint to prevent it freezing.

Between 1925 and 1926 Beau worked and studied in Paris, Spain, The Netherlands and Brussels becoming more enamoured and impressed with maritime art as time progressed. By the end of 1926 he had returned home to his family in Los Angeles and began to focus his work more on portraiture and maritime art and moved from oils to watercolour. Through commissions to paint portraits of United States Navy admirals, he formed an interest in the Navy and joined as a Lieutenant in the U.S. Naval Reserve in the area of Intelligence and Special Service in 1933.

His first exhibition of 39 paintings depicting the vessels and life in the Navy travelled throughout America receiving national acclaim and bringing Beaumont recognition and commercial success. Beaumont travelled on various missions with the Navy recording the activities, vessels and landscapes around him. Works were completed on board ship and also retrospectively once back on shore, based on sketches and notes completed on the missions. One highlight of this time was meeting President Roosevelt on the *USS Indianapolis* in New York Harbour. He resigned from the Navy Reserve in December 1934 but remained an official artist of the US Navy until 1977. His most prolific period came during World War II where he acted as an Artist Correspondent, painting ships and battle scenes for newspapers. These works were based on information sent from the war back to America, and then, using images of the ships involved, Beaumont would paint the work as he imagined the battle to be. After the war Beaumont continued to focus on maritime works, many commissioned by the Navy and involving trips to Japan, China, Guam and Vietnam. This included recording, with a series of over 180 watercolour paintings, the testing of the atomic bomb on Bikini Atoll in the Pacific. Early in the 1950s Beaumont suffered two serious injuries to his right arm resulting in him learning to paint with his left.

In 1957 Beaumont accepted a commission as staff artist to the US Navy's International Geophysical Year expedition to the Arctic. During the expedition he flew and sailed more than 48,000km, painting and sketching all the way, including works depicting the traverse of The Northwest Passage between the Pacific and Atlantic oceans. His work on this expedition paved the way for his inclusion in the Navy Task Force 43 to Antarctica in November of 1959. Beaumont became the staff artist attached to the *USS Glacier* and he created works depicting the exploration of the Bellinghausen Sea, as well as New Zealand/American teams working on the Polar Plateau. The watercolour in Canterbury Museum's collection was painted during this visit and depicts the USS *Glacier* and USS *Arneb* moving through the ice pack.

While in Antarctica Beaumont had an accident when he fell though a snow bridge into a crevasse and was saved by a New Zealand Navy captain who hauled him up, pulling his painting arm in the process. Beaumont completed 350 sketches and 25 paintings during this expedition to the Ice. His interest in Antarctica remained strong and in 1960, at age 70, he embarked on his second Antarctic adventure, this time with Operation Deep Freeze 61. During this trip he was offered a day visit to the South Pole, aiming to have around six hours painting time. Due to weather and transport issues his visit was extended to seven days. While there he completed three paintings and made many quick sketches outside for use in future works. His main achievement at the Pole was the successful completion of a painting showing the Amundsen-Scott South Pole Station. Painting at the Pole was problematic due to the cold however he overcame this by wearing several pairs of gloves and mixing torpedo alcohol into his paint to prevent it freezing. On completion of the expedition he held an exhibition in Christchurch through the sponsorship of the New Zealand Antarctic Society. The exhibition then travelled to Argentina, Brazil and California. From 1960 to his death in 1978 at age 87, he continued to produce maritime works, for both Navy and private commissions.

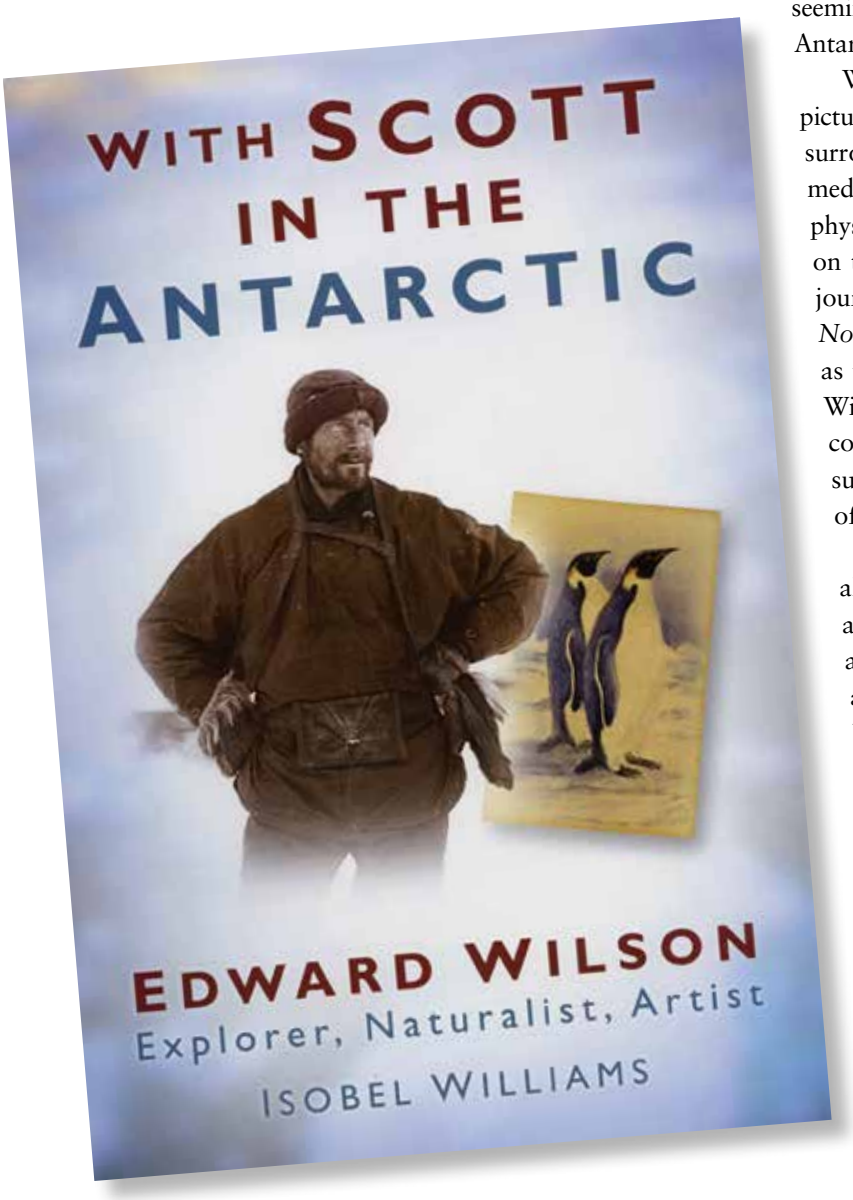
With Scott in the Antarctic

Edward Wilson – Explorer, Naturalist, Artist

By Isobel Williams

Edward Wilson (1872–1911) was born in the UK and throughout his life showed a great interest in drawing and natural sciences as well as medicine, which he studied at college. Because of his diversity of talent and personal attributes, when he was appointed as an expedition member of the British National Antarctic Expedition (1901–1904) under Scott, he took on multiple roles, that of medic, vertebrate zoologist and artist.

At the successful conclusion to the *Discovery* expedition, Wilson continued with studies from nature, both on the voyage back to the United Kingdom and then in his work on the Board of Agriculture's Grouse Disease Inquiry. He rejoined Scott as the scientific leader for the *Terra Nova* expedition in 1910 and continued to fulfill multiple roles: doctor, scientist, artist, friend and companion to Scott and mediator between the men of the expedition.



Wilson is portrayed by Williams as a man with both strengths and weaknesses and she provides a balanced viewpoint of these. She attempts to put Wilson, the scientist, artist, man of strong faith, friend and mentor into context, conveying both the time in which he lived and the environment in which he worked. Her writing follows his development from a childhood which included severe illness, through an interest in collecting to success in the seemingly diverse fields of science, medicine, art and Antarctic exploration.

Williams' easy to read style draws you into a vivid picture of his life, the people and the environments surrounding him. Due perhaps in part to her own medical background Williams is able to illuminate the physical and mental ordeal the men went through both on their way to the South Pole and during the winter journey to Cape Crozier. One aspect of the *Terra Nova* expedition which is perhaps not as well known as the South Pole journey is the scientific programme. Williams explains Wilson's scientific work within the context of both the era and Antarctic exploration and succeeds in presenting him as being at the forefront of natural science investigation.

The book contains twenty-eight photographs alongside black and white images of some of Wilson's artworks. It is one downside to the book that there are no coloured plates of the watercolour paintings as these would complement the text describing Wilson's delight in the colours of the Antarctic. In addition the inclusion of maps showing some of the places and journey routes would be useful, especially for newcomers to the Heroic Era of Antarctic exploration.

Williams' book is definitely worth perusing and will provide readers with insight into a complex Heroic Era Antarctic explorer.

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The distinctive shape of the Ceremonial South Pole, with its mirror ball and 'candy-cane' stripe, is shown with the full moon glowing directly overhead. Photograph taken on 14 May 2009 at 3:30pm by Jude Gregan