



Sea ice showing signs of aging



Photo by Erik Johnson / Special to The Antarctic Sun

A pressure ridge adjacent to the Erebus Glacier Ice Tongue is a result of the glacier's westward movement into the surrounding multi-year sea ice. The pressure ridge forced the relocation of the sea ice road to Cape Evans.

By Steven Profaizer
Sun staff

It's been almost eight years since the sea ice cleared out of McMurdo Sound, and it is now scarred with signs of growing old.

The ice makes no attempt to hide its agony from being pushed by glaciers and compacted under its own growing weight. Pressure ridges, cracks and refrozen melt pockets appear in great numbers across the sea ice surface. These growing hazards present new challenges for operations around McMurdo Station.

"The ice is very active," said Larry Cook, station operations manager. "Even in places it hasn't been before, we now see daily movement."

The conditions this year are a culmination of events that were put into motion by the arrival of iceberg B-15A in January 2001, said Doug MacAyeal, a glaciologist at the University of Chicago. That iceberg has now moved away from McMurdo Sound, but another large iceberg in the region may

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Inspired by Science

Antarctic workers return to school to become grantees

By Emily Stone
Sun staff

After five trips to McMurdo Station working in various science support jobs, Elizabeth Traver said the realization to switch careers came to her "like a kick in the head."

The people she enjoyed working with the most were the station's scientists. She loved sitting down for a meal with geologists or marine biologists and hearing them talk excitedly about their research. If this was her favorite part of being in Antarctica, she suddenly realized, then she should go back to school to get her own science degree.

Which is what Traver is doing right now. At 44, with an undergraduate degree in American studies and environmental studies, and a master's in American studies, Traver is working toward her master's in botany at the University of Wyoming and plans to go on to get her PhD. Her goal is to come back to Antarctica as a scientist, studying plants

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PENGUIn focuses on solar storm prediction

By Peter Rejcek
Sun staff

Geophysicists are looking south to Antarctica to see what's happening up above the Earth.

They hope a growing array of instruments on the continent will help better predict solar storms or lead to a better understanding of what happens to the upper atmosphere when it's pelted by stellar particles.

The Polar Experiment Network for Geospace Upper-atmosphere Investigations, or PENGUIn, is the latest effort to draw the big picture of cause and effect between the upper atmosphere and Earth. Toward this goal, PENGUIn's multi-university team is establishing a ground-based array of instruments in Antarctica to match the real-time data collection

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Quote of the Week

"We've got croutons coming out of our ears."

— Kitchen worker commenting on the abundance of food being prepared for Thanksgiving.

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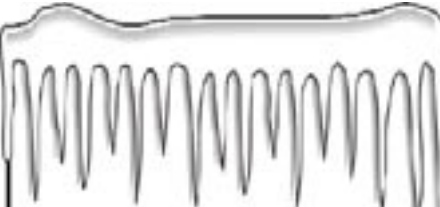
That holiday peeling



Photo by Peter Rejcek / The Antarctic Sun

Volunteers Karen McCleary, left, and Erica Almie peel potatoes Thursday morning in the dining hall kitchen. The two shuttle drivers volunteered on their day off to help prepare for Saturday's Thanksgiving feast. About 70 people volunteered this week to help prepare the holiday meal for McMurdo Station.

To feed the station population, the dining hall staff prepared, among other things, 500 kilograms of turkey, 140 kilograms of tenderloin, 230 kilograms of mashed potatoes and 180 kilograms of shrimp cocktail. For dessert, they provided 60 pumpkin pies (with 24 liters of real whipped cream), 40 pecan pies, 40 apple pies, 1,000 pieces of pumpkin cheesecake and another thousand pieces of chocolate cake.



Cold, hard facts

Greenhouse-grown

Monthly yield for greenhouses in October:

South Pole

Lettuce: **68 kilograms**

Cucumbers: **15 kilograms**

Tomatoes: **9 kilograms**

Herbs: **2 kilograms**

McMurdo

Lettuce: **31 kilograms**

Cucumbers: **23 kilograms**

Bell peppers: **6 kilograms**

Herbs: **1 kilogram**

Jalapenos: **200 grams**

McMurdo crops: Lettuce, cucumbers, bell peppers, tomatoes (just started and not yet producing), jalapenos, herbs (basil, mint, rosemary, tarragon, cilantro, parsley, thyme).

Source: Greenhouse staff

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Senior Editor: Emily Stone
Editors: Steven Profzaizer, Peter Rejcek
Copy Editors: Robert Ford, Ed Hyatt, Bill Jirsa, Rob Jones, Traci Macnamara, Melanie Miller, Erin Popelka, Laura Wright
Publisher: Valerie Carroll, Communications manager, RPSC

Contributions are welcome. Contact *The Sun* at AntSun@usap.gov. In McMurdo, visit our office in Building 155 or dial 2407.
Web address: AntarcticSun.usap.gov

Level 1 Comix

Matt Davidson



Listening in on the Earth

By Steven Profaizer
Sun staff

Scientists have their ears to the ground at South Pole and Palmer stations.

These locations are home to seismometers that are part of the Global Seismographic Network, a worldwide network of 139 similar facilities that monitor the earth's vibrations. The GSN continuously collects data from all seven continents and is located in about 60 countries. Five of the monitoring stations reside in Antarctica, including one at Palmer Station and one at the South Pole.

The study has a long history at the Pole. The program began in 1957 and is the longest running, continuously monitored project at the station, said Kent Anderson, the Incorporated Research Institutions for Seismology (IRIS) operations manager for the GSN.

"Any phenomena that directs significant energy into the ground, like earthquakes, explosions, or even storms, we can typically pick up," Anderson said. Several stations in the network even registered the collapse of the Twin Towers on Sept. 11, 2001.

The network is installed and operated by IRIS in partnership with the U.S. Geological Survey. IRIS is a consortium of over 100 universities supporting seismological research through funding from the National Science Foundation.

The seismometer network produces data that is disseminated to groups around the world, who use it for a variety of purposes, including monitoring earthquakes and tsunamis, assessing high-risk areas for these natural disasters, and aiding in hazard reduction.

"Tsunamis are generally created by earthquakes," Anderson said. "So the first evidence of possible tsunami generation is registered on seismographs."

Information gathered at the Antarctic stations can even be used to help scientists studying the movement of Antarctic glaciers. As the huge masses of ice creep forward, their weight redistributes. This pressure change on the continent gets logged by the seismograph.

Outside of studying naturally occurring events, the data is monitored for signs of nuclear weapons tests by the Comprehensive Nuclear Test Ban Treaty Organization.

While it takes a very powerful event to register on a global scale, local vibrations pollute the signals with background, or "cultural," noise. The relative absence of this interference in Antarctica makes the South Pole's monitoring station stand out.

The vibrations that typically muddle the

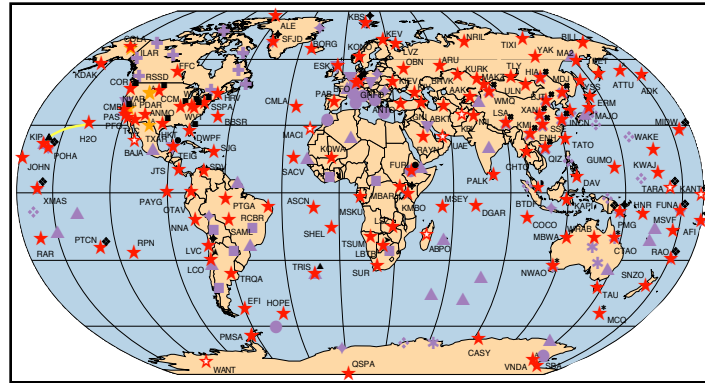


Photo courtesy of Kent Anderson / Special to *The Antarctic Sun*

The Global Seismographic Network is made up of 139 stations. The red stars represent the GSN stations. The purple shapes represent stations from other contributors. The red and white star in West Antarctica is the proposed location for a new GSN station.

signals are so low at Pole that instruments there can detect earthquakes on the other side of the world with an intensity as small as 4.0, which is described as noticeable shaking of indoor items and rattling noises directly over the source. The South Pole monitoring station is typically so far away from these small earthquakes that they only generate displacements of a few nanometers (about one billionth of a meter).

However, because the monitoring stations typically need to be located close to one of the U.S. Antarctic Program's stations for logistical reasons, even small seismic disturbances created by general station-related activities can mask some of the vibrations the team is trying to detect.

To combat this problem, the monitoring station was moved in 2003 about eight kilometers away from South Pole Station to the South Pole Remote Earth Science and Seismological Observatory (SPRESSO). The receivers for the device were then placed approximately 300 meters below the surface of the ice.

"We're still close enough that we can tell when everyone breaks for lunch, as well as when certain tractors are left idling and when they're shut down," Anderson said.

But the move has exponentially increased the effectiveness of the seismic station, and that is even more important at the South Pole because the Southern Hemisphere has a relatively small amount of land. Anderson said his group is very limited as to where they can put monitoring stations in the south. Having a high-quality station performing to this level has proven extremely valuable to the network.

The station at the South Pole is also important to the program because of its unique location on the axis of the earth.

"Think of the Earth as a big bell, and you hit it in one place like a large earthquake would hit the Earth," Anderson said. "You can actually pick up a ringing, like a ringing bell of the entire planet. For very large

earthquakes, such as the Sumatra-Andaman Island event on Dec. 26, 2004, the ringing was measurable for several months after the earthquake ended. In places besides the axes, the ringing is distorted, like taking a bell and spinning it while it rings."

This ringing is known as free oscillation. To get a pure sound of it, scientists must measure it from one of the two places on the planet that are not moving — the north and south poles. With no land mass at the North Pole, scientists would have to use an ocean bottom seismometer, which creates many more logistical challenges than the operation of a land-based facility.

The scientists running the network are interested in observing seismic activity over the course of many years. They have already made several discoveries that were only possible through years of studying seismology from the same location.

"We have some seismometers that have been recording data at the same point for such a long time that we are actually seeing some changes at the core of the earth," Anderson said. "We would expect the travel times of the signals we monitor to stay the same at the places we have been measuring for the last 50 years or so, but some of them have changed. That means something underneath, something in the core of the earth, is actually shifting and moving around."

The group is continually adding more stations to the network. Over the next five years, Anderson hopes to see two to three more permanent seismographs added to the network in Antarctica — one or two on the polar plateau and one at a camp on the West Antarctic Ice Sheet. These additional locations will enhance the presence of the GSN in the extreme Southern Hemisphere, which is sparsely covered but very significant for seismological studies.

NSF-funded research in this project: Rhett G. Butler, IRIS, <http://www.iris.edu/about/GSN/>





Perspectives Perspectives

Paying the *Hero* a visit

By Cara Sucher
Special to the Sun

Driving down the coast of Oregon this summer, I decided to make a stop in Newport. I had heard a piece of Antarctic history was moored there, and after five seasons at Palmer Station I was more than a little curious.

In my mind, the wooden-hulled 38-meter *Hero* was almost mythical. Named after the ship captained by 1820s sealer Nathaniel B. Palmer, the *Hero* served as the primary U.S. Antarctic Research Program vessel from 1968-1985. The *Hero* is legendary for its tight quarters and rough crossings. Some of our current Palmer researchers experienced their first taste of the Antarctic on the *Hero*. Ask the right questions and stories about the ship and the colorful Dutch Capt. Pieter Lenie abound.

As I drove through the narrow streets toward the waterfront, I wondered if I would be able to find the ship. I figured I could ask around and eventually come across her, probably in the back of some derelict boatyard. I needn't have worried. Sitting regally at the first dock in Newport Harbor was the *Hero*, a big sign draped across her side proclaiming in large capital letters, "HISTORIC RESEARCH VESSEL." It would have been impossible to miss the green-hulled ship if you tried.

Because she was so prominently located and proudly decorated, I decided to head down the dock for a closer look. Although she wasn't in tip-top shape, she still looked mostly as she did in her research days. The bridge, the pilot house above it, and the rigging were all the same. The wooden workboat, *Heroine*, and two small dories were missing, but the red sails were still there.

A friendly, grey-haired man working on deck saw me and waved. We started chatting, and he invited me onboard. He was Bill Wechter, a retired U.S. Coast Guard navigator and commercial fisherman — and the *Hero's* current owner. He has owned many vessels, but none, he says, as interesting or with such a rich history as the *Hero*.



Photo by Cara Sucher / Special to The Antarctic Sun
The historic *Hero*, now a private ship, sits in dock in Newport, Ore.

Bill apologized for the mess, explaining he was finishing some repairs. He asked if I wanted a tour, even though the power was out and he was removing some nasty interior insulation in the ceiling above the dining room.

We went inside the main deck, visiting the captain's quarters first. Unbelievably, it was almost exactly as Capt. Lenie might have left it. The bed was made, his issue bag held cold weather gear, and original files filled the shelves and drawers. An old typewriter sat against one wall, and a clipboard with a list of requisitions hung on the other. Antarctic stickers covered the doorway.

As we climbed down the steep stairway and walked through the lower deck, I was amazed at how many other original items remained from the vessel's research days. The labs still had microscopes, test tubes and chemicals for developing pictures; the galley was filled with pots, pans and other utensils; the fo'c'sle, or forward part of the upper deck, had shelves full of spare motor parts; and the communications room had lists of radio call signs for contacts in the Antarctic and the United States.

Bill recounted the *Hero's* post-Antarctic history. The National Science Foundation put her up for auction in 1985. Some folks from Reedsport, Ore., were interested in starting a floating restaurant, but realized she was better suited to be an Antarctic museum. The Port of Umpqua in Reedsport purchased the ship and raised money for an elaborate Antarctic center with the *Hero* as a major attraction. Eventually visitors could tour the ship, but the center itself never came to fruition.

About 10 years later, the foundation that owned the *Hero* ran into money problems and the ship was put up for auction again. The high bid, around \$40,000, didn't pan out. After a bit of legal wrangling, the *Hero* went to the next highest bidder, Bruce Norris, for \$5,000, and she sailed to Rainier, Ore. In 1998, family health problems led to the sale of the *Hero* once again, this time to Bill.

Bill sailed the ship to Portland and put her into dry dock for repainting and recaulking. In April 2000, he sailed the *Hero* to her current location. He hopes to sail her to Victoria, British Columbia, this summer for more extensive dry dock work.

Although the *Hero's* future is unknown, it is clear Bill wants to preserve the ship in a way that will honor her place in Antarctic history. Whether it be as a museum, a bed and breakfast, or as a tour ship, I don't know. But I do know that I am optimistic. The *Hero* represents a different era, one where Antarctica was still a faraway place, where you couldn't pick up a phone and call home or log onto a computer and read any newspaper in the world. And that's an important perspective to remember.

Cara Sucher is the supervisor of laboratory operations at Palmer Station.



Photo by Cara Sucher / Special to The Antarctic Sun
The former research ship, the *Hero*.

around the continent



SOUTH POLE

Thanksgiving at Pole

By Mike Mulvihill

South Pole correspondent

Just as the pilgrims celebrated a bountiful harvest on that first Thanksgiving in 1621, Polies are getting ready for their own Turkey Day feast this weekend.

The similarities between the two events are quite remarkable. Pilgrims had to cross treacherous seas and endure numerous hardships on their way to the New World. Polies have to travel many thousands of kilometers on several airplanes over many days to get to a place that is unlike anything that they could have imagined. Getting off the LC-130 for the first time, one can almost imagine what the pilgrims felt when they dropped anchor in Plymouth harbor all those years ago.

Coming to a far-off world and trying to create something different and new is exactly what is happening here at the South Pole, and the 239 people working to establish a thriving community is something worth celebrating.

Traditionally, in the United States, folks get a four-day weekend for Thanksgiving, which begins on the fourth Thursday in November. At the South Pole, there is always much work to do, so the celebration takes place on Saturday with the traditional turkey and mashed potatoes dinner split up between three seatings to accommodate the large summertime population.

The festivities start at 4 p.m. for the first seating, with the last meal at 8 p.m. It's a busy day in the kitchen, so there are many welcome volunteers who have signed up to help with everything from peeling potatoes to making pies to doing dishes.

The holidays are about being with family and friends. Here at the Pole, the people you work with and see everyday are your family and many become lifelong friends.

The traditional dinner will include: 16 turkeys served smoked and roasted, 27



Photo by Cara Sucher / Special to *The Antarctic Sun*

A pod of orca whales make a rare visit to the waters near Palmer Station. It's much more common to spot humpback and minke whales in the area.

kilograms of fried turkey, 55 kilograms of potatoes, 23 kilograms of shrimp, plus two kinds of stuffing, candied yams, roasted veggies, green bean casserole, peas, salad and cranberry-orange relish.

People are working hard outside the kitchen as well. As you walk around station, you see a hive of activity, hear planes on the flight deck, and watch loaders moving the cargo. Ironworkers are welding in the old garage, and the mechanics keep the equipment tuned-up and running. Painters, carpenters and others continue to work away on the elevated station. It's an around-the-clock operation to keep the South Pole humming.

The weather is getting nicer, with the daily temperatures averaging in the mid-to upper-negative 30s Celsius. After a few weeks of temperatures that were below negative 40, this is a welcome treat.

PALMER

Orcas, ship visit

By Kerry Kells

Palmer Correspondent

The winds came in briefly and pushed the pack ice away. The seas calmed, and the researchers were able to set up their Zodiac boats and sample at sites in the area. Recreational boating opportunities were available for a few days as well, with calm seas and sunshine.

The seabird researchers, known on station as "the birders," reached the islands of Torgersen, Humble, Litchfield, Cormorant and Christine. They will begin taking a census of the birds and recording reproduc-

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the week in weather

McMurdo Station

High: 28F / -2C

Low: 6F / -14C

Max. sustained wind: 24mph / 39kph

Windchill: -29F / -34C

Palmer Station

High: 47F / 8C

Low: 25F / -4C

Max. sustained wind: 42mph / 68kph

Precipitation: 0mm

South Pole Station

High: -19F / -28C

Low: -37F / -39C

Peak wind: 32mph / 51kph

Max. Physio-altitude: 3,246m

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tion as egg-laying has begun.

Palmer Station hosted the *Clipper Adventurer*, a cruise ship carrying 101 passengers, which made an unscheduled visit. The visit was arranged to help some of our community members get home. Seven people were waiting to leave when the ice conditions prevented the *Laurence M. Gould* from reaching station on its last trip. A nearly full ship meant that the *Clipper Adventurer* could only take four of the seven people north to Ushuaia, Argentina. They will then fly to Punta Arenas, Chile.

During the ship's arrival, a pod of orca whales cruised into Arthur Harbor, appearing interested in the Zodiacs and the people taking photos on shore. Unlike the humpbacks and minke, orca whales are not so common a sight at Palmer Station.

A limited number of cruise ships visit Palmer every year from mid-December to mid-February. Palmer works closely with the expedition leaders of each vessel to offer passengers tours of station, and an opportunity to learn about the U.S. Antarctic Program firsthand. This year, we have 18 cruise ships scheduled (including three off-shore lectures where the passengers don't come ashore) and some scheduled yacht visits. Private and charter yachts arrive at station from time to time during the summer season as well, and tours of the station are often given to the passengers and owners. We expect another cruise ship visit this week to take the remaining three departing Palmer workers north.

Paul Smotherman, our waste technician, presented a slide show on Nov. 16 titled "Climbing Around the World." Some of you may know Paul from McMurdo, but this year, he has joined the Palmer team for the summer. His slide show featured the 10 months of mountaineering and rock climb-

ing that he and his wife, Bija Sass, did after working at McMurdo for a full year. They traveled to New Zealand, Australia, Bali, Thailand, Ecuador and Peru.

SHIPS

LMG

Compiled from reports by Herb Baker
Marine Projects coordinator

After the *Laurence M. Gould's* failed attempt to reach Palmer Station on Nov. 14, it headed to King George Island to possibly transfer passengers and some cargo using Twin Otters from the British program. If conditions were favorable, the airplanes would transfer passengers from Palmer Station to the Chilean Frei Station on King George Island, and passengers and critical cargo from the island back to Palmer.

The *Gould* arrived at King George Island on Nov. 16. It received approvals from the British and United States science program officials for the transfer of passengers and cargo. Unfortunately, the weather conditions — low clouds and light fog — prevented the transfer. The ship steamed away the same day for Punta Arenas, Chile.

Winds of 28 kph through the Drake Passage slowed the ship to an average speed of 14 kph for the next couple days. The *Gould* was expected to arrive in port at Punta Arenas by the morning of Nov. 21.

NBP

Compiled from reports by Alice Doyle
Marine Projects coordinator

On Nov. 15, the *Nathaniel B. Palmer* made its way south toward its helicopter rendezvous site. It reached fast ice in the morning and found an area where a helo from McMurdo Station could land.

The site proved great for various reasons. First, it was more than one meter

thick and very flat, ideal for helo operations. Second, the underside of the ice was teeming with phytoplankton, so the ice coring team was able to core until they could core no more. Finally, the area was full of curious penguins. At one point, a group of 15 emperor penguins lined up next to the gangway, seemingly waiting to board.

Helo operations were delayed, so the *Palmer* stayed put, waiting for evening helo operations. It was another beautiful day. The helo arrived on schedule at 7:30 p.m. The ship got underway an hour later.

The next day the *Palmer* headed east in the polynya, mapping surface concentrations of chlorophyll along the way. There were distinct patches of increased chlorophyll along the route, which was a big change from a survey the week before. After a day, the crew picked a spot that met its needs and headed west.

Nov. 18 was packed with conductivity, temperature and depth (CTD) casts, and light measurements. A lot of water was collected early in the morning for various incubations in the helo deck incubators. After the water collection, the crew conducted various light measurements and more CTD casts throughout the day.

The next day was also busy, with lots of CTDs for incubations, light measurements, and various other water column measurements. The evening was beautiful with sunshine and completely calm water.

On Nov. 20, the crew deployed a floating array of instruments in the morning under minimal ice conditions. Unfortunately, these conditions did not hold; temperatures dropped, and ice started forming throughout the day. The array once again got stuck in the ice. But the ice this time was much thinner, which made the instruments easier to retrieve. The array drifted northward at less than two kilometers an hour throughout the day.

Continental Drift What do you miss least from home?



"People talking on their cell phones while driving."

Silver Williams,
WAIS Divide sous chef
from Salmon, Idaho,
fourth season



"Wal-Mart."

Kerry Kells,
Palmer senior
administrative coordina-
tor from St. Paul, Minn.,
eighth season



"Cell phones."

Julie Calkins,
graduate student at
McMurdo from
San Louis Obispo, Calif.,
third season

Passion for science turns into new career

From page 1

on the Antarctic Peninsula.

“The science community at McMurdo is amazing,” Traver said by phone from her lab in Laramie. “There are so many different people — all of them are very excited about what they’re doing. ... And I want to be like them.”

There are stories like Traver’s sprinkled throughout the U.S. Antarctic Program: people who came here as support staff and left wanting to become scientists. No one tracks these numbers, but most people who have worked in Antarctica a year or two can name someone they know who fits this mold.

Like Susan Kaspari. An environmental studies major whose primary focus after college was skiing as much as possible, Kaspari first came to Antarctica more or less on a whim. She got a job in 1998 and 1999 in the McMurdo fuels department.

“When I first got to Antarctica, I was absolutely thrilled to just be there,” she said via e-mail from an ailing computer in China, where she’s doing field work for a PhD in glaciology. But she soon grew tired of being stuck on station and noticed that the scientists seemed to be doing exciting work all over the area.

Inspiration came when she got a three-week gig refueling helicopters at Marble Point on the edge of the McMurdo Dry Valleys that first season.

“After work I would spend hours walking around Marble Point, climbing the hills and looking at the Piedmont Glacier,” said Kaspari, now 31. “I was so intrigued by the glaciers and the ice sheets. But I didn’t understand much about glaciology and wanted to learn more.”

She read through the summary of the year’s science projects. Then she started e-mailing scientists whose projects she found most interesting and met with numerous researchers on station during the two years. She continued to find herself drawn to glaciology, especially as it related to climate change.

“I left the Ice in 2000 determined to return, but not until I could come back as a scientist,” she said. The next summer, she was invited to work as a field assistant in the Dry Valleys with a Long Term Ecological Research group that was studying glaciers. She brought along her graduate school applications and filled them out in the field.

She was accepted to the University of Maine, and spent the next two field seasons working with the International Transantarctic Science Expedition, traversing the continent while taking ice cores. She’s now working toward her PhD, focusing on Asian climate variability.

“After five seasons in Antarctica, I decided to move on to other regions,” she said, having just finished collecting ice cores from the Chinese-Tibetan border. “But I miss the Ice and hope to work there again someday.”

Kelly Brunt managed to go from support staff to scientist without leaving the same McMurdo building.

She has an undergraduate degree in geology and a master’s degree in geophysics, and spent four years with Raytheon Polar Services Co., working as the Geographic Information Systems (GIS) mapper at McMurdo and in Denver. She spent much of her first season here mapping the movement of the giant icebergs that calved off the Ross Ice Shelf in 2000.

Glaciologist Doug MacAyeal is studying those icebergs. After a year or two of working with Brunt, he asked if she would like to join him back at the University of Chicago as a PhD student.

Brunt said it felt too early to switch jobs, but asked him to

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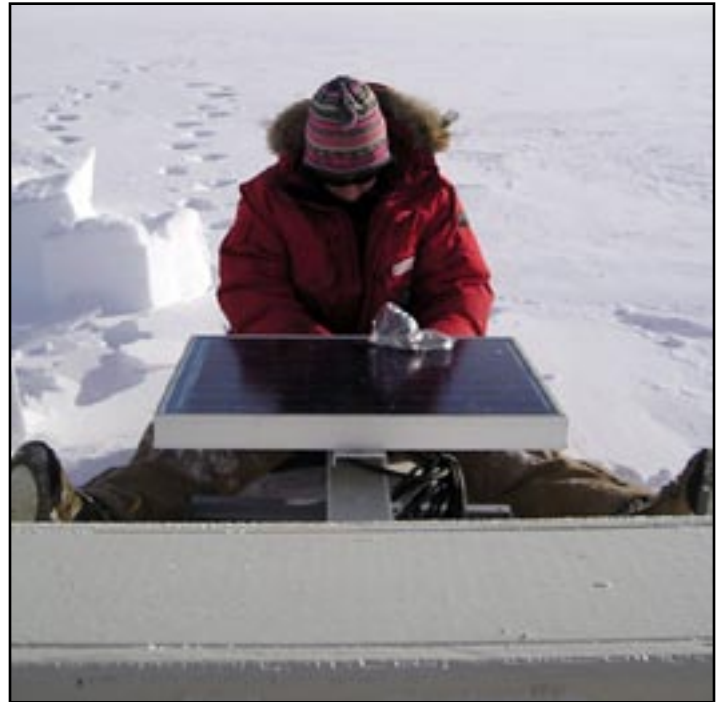


Photo courtesy of Elizabeth Traver / Special to *The Antarctic Sun*

Elizabeth Traver works on equipment on the C-16 iceberg. A former support services employee, she’s now working toward a science degree after being inspired by researchers here.



Photo by Levi Littrell / Special to *The Antarctic Sun*

Kelly Brunt, right, and Jonathan Thom deploy an automatic weather station tripod at the Drygalski Ice Tongue in late October. Brunt went from mapping icebergs to working on them as a scientist.

Scientists also switch to other careers

From page 7

keep her in mind in the future. He did, and when he asked again a couple years later, she accepted. She's now in her second year with the program. She spends two months each summer in a lab downstairs from her old office in the Crary Science and



Susan Kaspari left the Ice in 2000 determined not to return until she could work in science.

Engineering Center, preparing for trips out to the icebergs.

She likes the constant puzzles that scientific work offers — a challenge that she got occasionally in her old job but now gets more consistently.

Switching from support staff to scientist was a fairly seamless transition, she said.

"It was different, but it wasn't like I was going to be a penguin researcher," she said.

Not everyone making a career move within the Antarctic program goes from support staff to scientist. The path goes the other way, too.

Cara Sucher, supervisor of laboratory operations at Palmer Station, started as a scientist. She went to

graduate school in oceanography and spent eight weeks in 1995 collecting ice cores in East Antarctica, then helped on a couple research cruises.

After that, she spent time in two jobs in Washington, D.C., doing policy work and grant reviews. It didn't suit her. Antarctica did. So she decided to return and got the job with Raytheon Polar in 2000.

"I wasn't really satisfied with what I was doing. A lot of what I did was planning for so far in the future and I never actually got to see it come to fruition," she said. "Here it's very satisfying." She spends the off-season in Denver planning for the

upcoming science and then travels to Palmer and puts the plan into place.

She's thought about doing research again, but she said she likes what her current job offers.

"What I really like about this job is I kind of get an overview of all different kinds of science," she said. "I don't have to spend my time focusing on one very narrow area."

There are likely people at each of the U.S. stations contemplating making their own move across the divide between science and support staff. Gifford Wong has been eyeing the other side of the line for several years.

He started at McMurdo five years ago as a general assistant and came back the next year as a carpenter helper. Now he's returned as a helicopter technician. The next time he's here, he hopes it's as a scientist.

He made a summer road trip a few years ago, driving to eight different schools to talk with scientists whom he'd met here. A job offer with AmeriCorps won out over going to graduate school at that point. But he's ready this time. He took the graduate school entrance exam two days before leaving for Antarctica and plans to talk to as many scientists as possible while here to hone his plan. He knows he wants to study climate change with a focus on public policy, but he hasn't settled on what scientific avenue to take.

"I'm on the diving board," he said of his plan to go back to school. "I would like to make that jump."



Cara Sucher started her career in Antarctica as a scientist but now works as a lab supervisor at Palmer Station.

Solar storms may affect radio comms, ozone hole

From page 1

going on across the equator.

"The northern hemisphere is very well instrumented," noted Allan Weatherwax, the project's principal investigator and associate professor of physics at Siena College in Loudonville, New York. "The Antarctic isn't as well covered."

Understanding the sun's influence on Earth's global space environment requires detailed knowledge of the polar upper atmosphere, according to Weatherwax. "This extremely complex natural system involves many different interacting elements, and Earth is the only planetary system that we can expect to study in detail," he said.

"What we're trying to do now is ... predict when solar storms might occur," he added.

Such storms, also called coronal mass ejections, can affect everything from GPS signals to radio communications. Aurora can also induce currents in the ground, disrupting power grids and causing the premature corrosion of pipelines.

"There's a real need to understand or predict when these storms occur and when they might be detrimental," Weatherwax said. "We're looking at disruption in communications, chemistry of upper atmosphere, radio communications: We're trying to understand what the Earth's response is to these phenomena. We're trying to understand the sun-Earth connection."

Solar storms can also cause changes in the very chemistry of the upper atmosphere. Scientists are just now asking questions about how that might affect something like the ozone hole. For instance, does it become more pronounced during a solar downpour or after a series of solar storms?

"This is a question we're going after," Weatherwax said.

Observing space weather

Weatherwax and his colleagues are particularly interested in the planet's upper atmosphere, consisting of the magnetosphere and the ionosphere. That's where so-called outer space begins, about 90

kilometers above the Earth.

In addition to light, the sun emits an electrically charged gas known as solar wind, which carries part of the solar magnetic field along with it as it streams away from the sun. The solar wind is composed almost entirely of electrons and protons. The magnetic cavity carved out of the solar wind by virtue of the magnetic field surrounding Earth is called the magnetosphere.

The ionosphere forms the inner edge of the magnetosphere, and is important, in part, because it influences high-frequency radio waves to distant parts of the planet. The other magnetized planets, Jupiter, Saturn, Uranus and Neptune, also have a magnetosphere.

"If we can understand our own space environment, we will better understand other planetary systems as well," Weatherwax noted.

Currently, there are three ground-based automatic geophysical observatories

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New observatories cater to PENGUIn project

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(AGOs) in Antarctica collecting data for PENGUIn. The observatories exist along an axis with and including the South Pole Station, running in a rough line between the Weddell Sea and Dome C for several hundred kilometers.

The AGOs track auroras in the sky and observe the impact of solar flares on the upper atmosphere. The observatories consist of a suite of nearly identical instruments, including optical and radio wave aurora imagers, magnetometers and narrow- and wide-band radio receivers. They have been in place for previous projects. But most of the infrastructure, including the Iridium modems, is new and redesigned, according to Weatherwax. Additionally, as part of the PENGUIn project, new low-power instruments such as magnetometers and VLF receivers are also in development.

The Iridium modems are particularly important, he said, because they allow researchers to get the data in real-time. That's key for studying upper atmospheric space weather because real-time models require real-time data.

Eventually, the AGOs will create a chain from low to high latitudes so that scientists can observe auroral phenomena over a wide region. They will also be able to compare such observations with those in the north since energetic particles can bounce back and forth between hemispheres, guided by the Earth's magnetic field, similar to a bead as it slides along a string, he said.

"A lot of the phenomena we see — the aurora, the northern lights, the southern lights — occur in the north and south polar regions," Weatherwax explained. Being able to see what's happening in both hemispheres will further reveal the asymmetries between the two magnetic poles and make space weather predictions more accurate.

Satellites offer another pair of eyes for researchers studying the upper atmosphere, working in concert with the ground-based observatories. The THEMIS satellite, to be launched in October 2006 by a University of California, Berkeley-led team, is headed into space and will help scientists study auroral substorms, according to Weatherwax.

"We're putting our instruments underneath where satellites are going to be," he explained. "So we look up and they look down."

So far, scientists are pleased with the results from the unmanned observatories, with nearly 95 percent of the data being transmitted via Iridium modem. The AGOs run mainly on solar and wind power.

Researchers from Berkeley and Stanford University will visit the three remote sites in line with the South Pole to troubleshoot and conduct maintenance this season, he



Photo by Jeff Chang / Special to *The Antarctic Sun*

Automatic geophysical observatories, like this one on the polar plateau, measure solar events in the upper atmosphere.

said.

Weatherwax said he plans to arrive at McMurdo shortly after Christmas. Part of his task this season will be to continue the transplant of instruments from the Skylab science building at South Pole Station to the science module of the new elevated station. The South Pole instruments are the model upon which the AGO instruments were based, he said.

Changing technology

When the last kinks are worked out of the current AGOs, more observatories will likely be added. Researchers at the University of New Hampshire are already designing the next generation of these observatories. The current buildings are orange and rectangle-shaped, and could fit in the back of a mid-sized pickup truck.

The new modules, called Autonomous Remote Real-Time Observatories, or ARROs, are expected to get their first test run in Antarctica next season, said Marc Lessard at the University of New Hampshire.

While the new ARRO modules are not specific just to PENGUIn, many of the designs were done with that project in mind, according to Lessard.

"It's a redesign from the ground up," he said, adding that the observatories can be disassembled and reassembled in the field, meaning they can be transported to remote field sites in something as small as a Twin Otter. The AGOs required the larger LC-130

for transport. And while the AGOs were modified by PENGUIn researchers to run off solar and wind power, the ARRO modules are specifically designed to run with only the help of Mother Nature. Lessard said the prototype can operate up to 11 days on a full charge in windless conditions.

"So far, we believe we can do [11 days]," he said of the wind-driven generator in the ARRO.

"The PENGUIn team has done a really good job of resuscitating the AGOs, keeping them going on wind and solar power," Lessard added. He explained that researchers need continuous observation to paint the fullest picture possible of what's happening in the upper atmosphere. "You never know when you might miss something exciting," he said.

Weatherwax said that like in other fields, the technology available to researchers for this science would continue to evolve and get better. He pointed out that only five years ago there was no Iridium connection. A decade or so ago, winter data from Pole wasn't available until the first planes flew in during late October or early November, about eight months since the last visit.

"[Modern communications] actually opened up the Antarctic for this type of research," Weatherwax said.

NSF-funded research in this story: Allan Weatherwax, Siena College, <http://polar.umd.edu>; Marc Lessard, University of New Hampshire, <http://esp.sr.unh.edu/mirl>

Sea ice may blow out this season

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continue to influence the sea ice.

“While B-15A has been the major culprit over the past four years in maintaining high sea ice coverage in the area,” MacAyeal said, “C-16 has provided a smaller, but still important influence on the local sea ice conditions near where the icebreaker begins its channel into the sea ice near Beaufort Island.”

The age of the sea ice is another complication. The ice has grown each year and now presents a much more formidable opponent for winds whipping across the ice, which used to blow it out to sea.

“It’s possible that the ice will break out this year, but the fact that it is now so thick will make it harder,” said Jim Mastro, interim Crary Science and Engineering Center supervisor. “The only reason we have any hope of that happening is that the big icebergs are gone. The sea ice can go out now, if it wants to.”

U.S. Antarctic Program participants at McMurdo have been traversing the sea ice for the last 50 years, but the last two years have challenged the way science teams conduct research, surveyors design runways, and fleet operations personnel plan and maintain snow roads.

“This is a new situation than we have ever faced before,” said Mastro, who recently completed his job as interim lab supervisor. “These conditions have never been seen by the U.S. Antarctic Program.”

And there’s not a lot anyone can do to improve the situation. Scientists and logistical workers must adapt their efforts to overcome the challenges the sea ice presents.

“There are two major ways that the sea ice affects the science groups,” said Mastro. “The first is on the logistical capacities to get out into camps and into the ice to dive. The second is on the science itself. The conditions affect the animals that scientists are trying to study.”

Few understand these factors better than Bob Garrott, who is the co-principal investigator of a science group studying Weddell seals from a camp at Big Razorback Island.

The sea ice conditions of the last two years have cut the seal population in Erebus Bay by about 60 percent.

From its camp on the sea ice, the team has been able to watch the ice degrade at a faster rate than normal. By the time they closed down last summer, pools of melted ice surrounded the four huts.

“We know there is a chance we will have to be pulled in early this year,” Garrott said. “We are trying to get ahead of schedule to make sure we get everything done.”

The sea ice has been speeding up operations all over the McMurdo Sound as teams work to keep ahead of constantly changing ice conditions.

Surveyors and fleet operations personnel are getting an early start on next year’s ice runway by investigating the possibility of having the ice breaker clear out an area that would



Photo by Peter Rejcek / The Antarctic Sun

Trevor Deighton, with the field safety training program, demonstrates how to profile a sea ice crack to determine if it’s safe to cross during a training course last month.

be a good location and size for the runway, Cook said. If they find a feasible location and secure the needed support, this plan should allow fleet operations to build the runway on the much smoother and more predictable first-year ice.

This season’s runway is the first that had to be built in the previous year’s icebreaker channel. The survey team has seldom had to worry about where to put the runway until it was almost time to construct it, Cook said. But the sea ice bears the marks of seven years’ worth of runways now, and the team has simply run out of good places to put them. Building the runway in the channel instead of on the old sea ice allows teams to take advantage of the smooth ice that formed in the path of the ice breaker after it left, he added.

The ice runway is used until early December, when the sea ice begins to weaken to an extent that one would not want to land a 45,000-kilogram aircraft on it. The runway facilities are then relocated by tractor to Williams Field on the permanent ice shelf.

This move itself is also proving to be a considerably larger task than normal this year, as the direct road to Williams Field is closed due to poor stability.

“It’s just really bad ice through there,” said Gary Cardullo, airfield manager. “We’re not going to take a D-8 [tractor] through it and risk someone falling through a hole.”



A sea ice disturbance near the Erebus Glacier Tongue.

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Penguin genetic code key to microevolution

From the National Science Foundation

By comparing the genetic code retrieved from 6,000-year-old remains of Adelie penguins in Antarctica with that of modern Adelies living at the same site as their ancestors, an international team of researchers has shown that microevolution, the process of evolutionary change at or below the species level, has taken place in the population. They also speculate that the remarkable lack of genetic differentiation among Adelie populations from around Antarctica may have been prompted by changes in migration patterns caused by giant icebergs.

An international team of researchers from Italy, New Zealand and the United States conducted the research and published their findings this month in the Proceedings of the National Academy of Sciences. The scientists include David Ainley, who is currently at McMurdo Station working on his study of the Ross Island Adelies.

Although previous studies have looked at genetic changes in populations of other species, they generally have focused on changes over relatively short periods of time, such as several decades.

Comparison across thousands of years is possible because the



Photo by Peter West / National Science Foundation

The penguin colony at Cape Royds on Ross Island is the focus of a study on microevolution.

extremely cold and dry conditions of the southernmost continent — conditions found almost nowhere else on Earth — preserved the ancient penguins' physical remains so well.

To read the full press release, go to www.nsf.gov/news/news_summ.jsp?cntn_id=104626

Williams Field road redirected due to ice instability

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Fleet operations will instead make the journey along a detour route toward Pegasus White Ice Runway, adding another day and several kilometers to their trip.

"The McMurdo Ice Shelf keeps marching relentlessly this way at over [90 meters] a year," said Gerald Crist, fleet operations supervisor. "I've been coming here since 1989, and this is the first time I've seen the ice destabilize like this right in front of station."

Several other snow roads and routes along the ice have also been closed or redirected to avoid particularly problematic areas.

Crist canceled a second traverse to the Marble Point helicopter refueling station this year because the first trip proved the path too difficult to travel. Until a suitable sea ice route is prepared, the traverse team has lost its ability to provide Marble Point with fuel and other supplies. Fortunately, Cook added, the station has enough fuel to make it through at least part of next season.

This season's traverse team encountered all the anomalies found in multi-year sea ice on their journey to Marble Point. The most devastating to equipment and hazardous to personnel was the thin ice covering large, hollow melt pockets up to a meter deep, Cook said. The ice would shatter as the equipment rumbled across it and suddenly send it dipping to one side or another.

The traverse team follows a general path to Marble Point, but there is no maintained route. Such a route will need to be



Photo by Joe Stanford / Special to The Antarctic Sun

The oil tanker Lawrence N. Gianella follows a U.S. Coast Guard icebreaker to Ross Island in this Antarctic Photo Library image dated Jan. 14, 2004. Based on the behavior of the sea ice this season, local officials believe ship passage to McMurdo Station may be easier than in recent years.

developed before they can make another trip, Cook said. That route will likely be constructed next year, if the current sea ice is still here next summer.

The sea ice is also complicating recreation opportunities. Trips to Cape Evans had to be canceled this year due to sea ice activity near the Erebus Glacier Tongue, said Rachel Murray, recreation supervisor. However, the recreation department secured approval for trips to the historic downed air-

plane at the Pegasus runway and to a place along the road leading to Cape Evans to view some of the sea ice disturbances from a safe distance.

Despite how closely it is being watched, only time will tell if the old sea ice will release its grip on McMurdo Sound.

There are some general rules of what to expect when dealing with the sea ice, Mastro said. But the ice seems to break those rules almost as often as it obeys them.

Profile Plotting the perfect crime (novel)

By Steven Profaizer
Sun staff

There will be a murder in Antarctica. And mystery writer Sarah Andrews intends to figure out how it's going to happen.

Luckily for current U.S. Antarctic Program participants, the murder will not take place on the continent itself but in the pages of Andrews' upcoming novel about geologist-sleuth Em Hansen.

"In Cold Pursuit" will be the 11th installment in the Em Hansen forensic geology mystery series, which follows the heroine around the world as she digs for scientific truth and searches for answers to cold-blooded killings. Andrews does not yet know when the book will be published but expects it may hit bookshelves in 2007.

Andrews travels extensively while plotting her novels and is now in Antarctica as part of the National Science Foundation's Antarctic Artists and Writers Program to create her newest devious storyline.

Andrews said she has a wide reader base — from leading geologists to mystery-loving laypeople. Her challenge is to make the scientific information in her novels accurate and interesting to scientists and soccer moms at the same time.

"Part of my job is to make them all the same audience," she said. "According to the [Microsoft] Word checker, I write to about the fifth grade reading level. [Part of what I do] is to take the whole thing and put it at a level that reads like greased lightning."

One way Andrews helps readers grasp concepts they have never learned and see places they have never been is through metaphors and descriptions comparing the unknown to the known.

"If I want them to think about the Earth as a tender sphere, in that it has a fragile crust with lots of molten stuff underneath it and a hard core, why not choose a peach?" she said. "It's not the best example, but it is something that most people have held in their hand, had a very intimate experience with, bit into, and enjoyed. It takes them to a place that they might not otherwise have been able to conjure."

Most people will never experience the locations and events described in her novels, especially in a place as remote as Antarctica. Andrews sees it as part of her job to experience life here, so she can relate it to the lives her readers know. To help learn the realities of working on this continent, she is spending some time in the field with science groups in the McMurdo Dry Valleys led by geologist Jaakko Putkonen and climatologist Karl Kreutz.

To best recreate the experience her main character will go through, Andrews said she needs to understand the details herself. If her main character drives a PistenBully, Andrews must be able to describe to readers the difference between driving that and driving the Volkswagen parked in their garages.

"The written word can take a reader into a space that photographs cannot, and vice versa," Andrews said. "I write something by consolidating my experience into words the reader then plays back. I'm writing the music they play on their own mental instrument, if you will. They're recreating the experience and sometimes create more than I write because they're bringing into it shreds of their own experience."

Andrews hopes that by experiencing life in Antarctica she can



Photo by Bruce Williamson / Special to *The Antarctic Sun*

Sarah Andrews in the McMurdo Dry Valleys, where she is spending time with two science groups to do research for an upcoming novel set in Antarctica.

not only give the reader a better understanding of how work is done here but also a better feel for the culture and people who participate in the Antarctic program. She says the essence of the plots she weaves is human interaction.

"Murder mysteries are really tragedies," she said. "They're based on my supposition that interesting fictional murders do not happen in a vacuum. They have their basis in the community, in the way people are interacting in the community. That's actually one of the biggest technical problems I face in this book is why anyone down here would kill anybody."

Trying to answer that question is a task few geologists face. But Andrews is using her education in a far different way than most people with a master's degree in geology.

She has spent most of her life working as a scientist — in the field and in the classroom, and

most recently in the pages of her mystery novels. She said she crafts the books into tools of educational outreach. Through her keystrokes, she uses stories of murder and mystery as a vessel to deliver an understanding of geology and geologists to her readers.

"I don't really make the distinction between my work as a writer and my work as a geologist," she said. "If pressed, I prefer to be known as a geologist. I'm uncomfortable with being known primarily as a writer because it isn't my primary passion. It is, however, something I've developed and enjoy doing tremendously."



"One of the biggest technical problems I face in this book is why anyone down here would kill anybody."

— *Mystery writer Sarah Andrews*