



January 18, 2004

## Taking the temperature of sea ice

By Kristan Hutchison  
*Sun staff*

Arctic researchers came to the opposite end of the world to check the sea ice temperature and compare it to the frozen north.

Temperature and other vital signs may explain why Arctic and Antarctic sea ice melt differently. On a large scale, the Arctic sea ice has shrunk by 300,000 square km every decade since 1972, while the Antarctic has lost half as much ice and in recent years has expanded.

At McMurdo Station, sea ice is the stuff people ski on, drive on, land planes on, and then try to break a channel through for resupply vessels. Around Barrow, Alaska they also snowmachine across the ice in the winter, then launch boats to hunt whales in the spring.

Globally, the frozen polar seas have an important, if less obvious, role.

"The ocean is the biggest reservoir of heat on the planet and if you can get the heat out that can do a lot to warm a place," said glaciologist Hajo Eicken, one of two Alaskan sea ice researchers now in McMurdo for several weeks.

Like huge reflective panels, the sea ice bounces most of the sun's heat away from Earth. At the same time, the ice insulates the ocean, keeping the water from releasing its stores of heat into the air. Without the sea ice covering McMurdo Sound, the area would be much warmer than it is now, Eicken said. Thaw the entire Antarctic or Arctic oceans and the warming would be felt worldwide. The ocean would collect and store more of the sun's heat, then release it when the sun was out of sight.

"Arguably, the sea ice cover in the Arctic and in the Antarctic is so important for the

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Photo by Scott Metcalfe / Special to The Antarctic Sun

One of the South Pole traverse vehicles struggles through deep snow, which slowed the traverse.

## Snow slows traverse

By Kristan Hutchison  
*Sun staff*

On a wide, white prairie, a caravan of tractors and trailers halted and five men stepped out, holding wrenches and arc welders the way John Wayne and Clint Eastwood once slung guns.

"It's like a spaghetti western in an Antarctic setting," said Scott "Scooter" Metcalfe, a mountaineer who spent the last month with the South Pole traverse crew he dubbed "The Problemsolvers."

Sleds wallowing in powdery snow, pins snapping and chains breaking – nothing stopped John Wright, Russell Magsig, John Penney, Rich "Stretch" Vaitonis and James McCabe as they forged a path southward. But the numerous challenges caused by unexpected snow conditions did slow the traverse, which at times slogged along

at a walking pace.

"Though we are disappointed that we are not making the southward advance at a better pace," Wright wrote in a report Dec. 10, "each man among us is committed to advancing south as far as half our fuel will take us before heading back to the barn, learning as much as we can about crossing this Ross Ice Shelf."

The traverse was the second in a three-year proof of concept program to test the possibility of partially supplying Amundsen-Scott South Pole Station by land. Last year the traverse crew crossed the Shear Zone, filling in crevasses in the heavily cracked area as they went. This year five vehicles left McMurdo on Nov. 18, pulling fuel, supplies, and living quarters, to see how far

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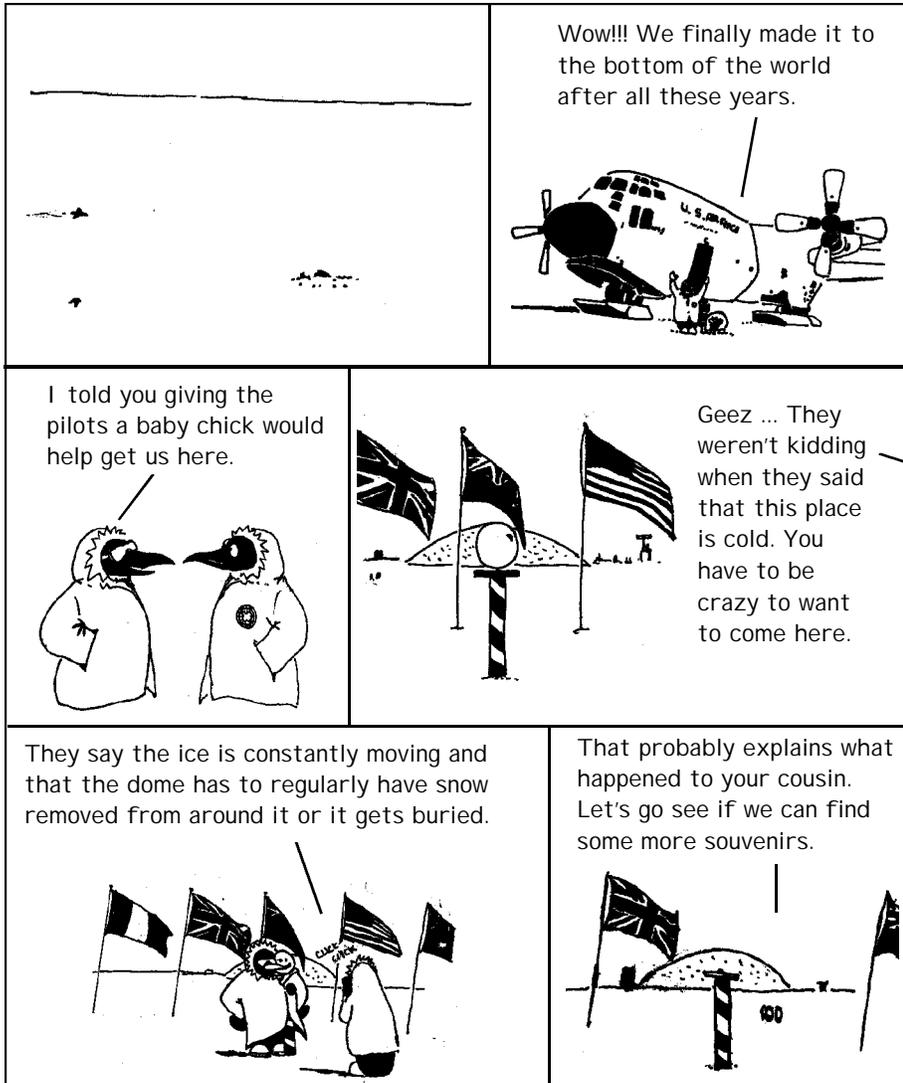
### Quote of the Week

"I'll never volunteer again to clean up a volcanic island."

- Janitor at McMurdo Station

Ross Island Chronicles

By Chico



# Cold, hard facts

## Arctic vs. Antarctic

Arctic: **Sea ice thickness avg: 1.5 m**  
 Antarctic: **Sea ice thickness avg: 2.5 m**

Arctic: **Land ice is intermittent**  
 Antarctic: **97.6 % of land is ice covered**

Arctic: **North Pole is 1 m above sea level, bedrock is at 4,300 m below sea level**  
 Antarctic: **South Pole is 2,912 m above sea level, bedrock is at 34 m above sea level**

North Pole, annual mean temperature: **-18 C**  
 South Pole annual mean temperature: **-50 C**

Arctic: **450 species of flowering plants between 66-77 degrees N. Lat.**  
 Antarctic: **2 species of flowering plants between 66-77 degrees S. Lat.**

Arctic: **Human population north of 60 deg. N. lat.: more than 2 million**  
 Antarctic: **Human population south of 60 deg. S Lat: About 4,000**

*Source: USAP poster (1998)*

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**Matt Davidson**

## A brief history of suffering and deprivation in Antarctica

<p>1912</p> <p>Robert Scott and his party perish from starvation and exposure on their way back from the South Pole ...</p>	<p>1914-1917</p> <p>Ernest Shackleton's group battles hunger and cold while stranded on ice floes for over a year ...</p>	<p>2004</p> <p>THE ICE CREAM MACHINE IS DOWN AGAIN?!</p>

# Warming world melts Palmer's glacier

By Kristan Hutchison  
*Sun staff*

**G**lobal warming is hitting Palmer Station in the backyard.

Average temperatures on the Antarctic Peninsula have risen 3C in the past 50 years. As the climate warms, workers at Palmer Station watch the glacier behind the station recede. The steady retreat of ice exposes more of the granite point where the station's blue buildings cluster.

"It's retreating pretty quickly," said last winter's science tech Zan Stine. "You can see the evidence just by looking at it."

He and the other science techs have been surveying the edge of the glacier each year. Since 1963 it has receded about 300 meters, more than doubling the area of exposed rock the station stands on. The toe of the glacier has receded an average of 9 meters a year, said station manager Joe Pettit.

"That ice cap is losing mass by melting and it's likely in response to the increased degree days, the number of hours in the summer that the temperature's above freezing, which has led to more melting," said Eugene Domack, from the Hamilton College department of geology.

Though no grantee is currently studying the glacier behind Anvers Island, Domack has been studying glacial evolution around Palmer Station over a longer time scale by drilling sediment cores from the deep basin nearby. The layers of sediment show how far the ice cover extended at different times. About 13,000 years ago the ice cap covered all of Anvers Island, including where Palmer Station now sits, and extended out onto the continental shelf. Since then it has been receding slowly toward Anvers Island and the mainland peninsula, according to a paper by Domack which is now in review in *Geomorphology*.

That slow recession was due to sea level rise as the Earth came out of a glacial period and ice sheets melted in the Northern



Photo by Kristan Hutchison / The Antarctic Sun

Mark Mugge walks down the glacier on Anvers Island toward Palmer Station on a Sunday in September. The glacier is the only walking route from the station, but is receding.

Hemisphere, Domack said. But the more recent melting is probably in response to more rapid temperature changes over the last 50 years, which also have been linked to the collapse of the Larsen Ice Shelf in 2002, Domack said.

"The ice shelf is responding slowly over decades and decades to the point where it can no longer accommodate any additional melting and then it breaks up catastrophically," Domack said. "The ice cap on Anvers Island responds to decades of warming by slowly losing more snow each year than it gains. Therefore the terrestrial margin, the terminus of that ice cap, is receding inland and up slowly over time."

The receding glacier also has exposed more of the inlets on either side of the small peninsula, receding 27 meters a year in parts of Arthur Harbor. Crevasses have moved inward, narrowing the area marked each year as the only safe walk from the station. Many of the crevasses heal themselves as the glacier melts and stagnates, Pettit said.

"You'll always be able to walk up some, but not to the top," Stine predicted. "That would really change the place. You need that walk every Sunday or you go crazy."

Palmer is the smallest of the U.S. Antarctic research stations, not just in population, currently 39, but also in space. The top of the glacier is the farthest people can walk from the station, a roundtrip of almost 5 kilometers if they include a side trail to Bonaparte Point and back.

"You can get up there, it's quiet, you don't hear the generators. You can look down and see a totally different spot," said Dr. Kristin Vankonynenburg. "It's a spiritual place for a lot of people. It's a place you go to regroup and leave the worries of the day behind."

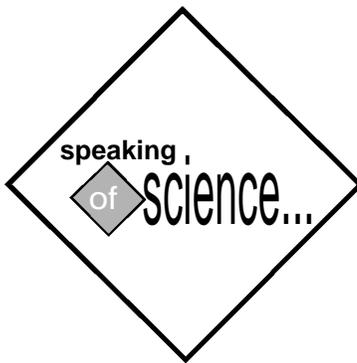
The melting glacier has already changed other aspects of station life. When Pettit came in the 1990s, the station water was drawn from a pond of glacier meltwater. As the pond dried up, the station in 1995 switched to using reverse osmosis to desalinate seawater for drinking.

A similar thing is happening at Old Palmer, the site a short boat ride away where the research station was until 1968. In the last 15 years, the ice there has receded dramatically. This month the ice ridge joining Old Palmer with Anvers Island collapsed, leaving Old Palmer on its own island, Pettit said.



Photo by Kristan Hutchison / The Antarctic Sun

Warning sign marks the edge of the safe area on the glacier behind Palmer Station.



# Field Paleontology at Seymour Island

By Dan Blake  
*Special to the Sun*

Seymour Island, off the northeast coast of the Antarctic Peninsula, was visited during December 2003 by a small group of researchers interested in the effects of climatic cooling 35 or 40 million years ago on shallow-water marine animal communities. Seymour Island is figure-eight shaped and only a few miles across, and the sediments under study are exposed on the northward loop of the "8." The island is free of permanent ice, perhaps in part either because it is in a snow shadow of nearby land areas or because of characteristic high winds. The sediments on the island are mostly quite soft (not hard rock) and the island is eroding very quickly, with much sediment carried to the sea each year during the brief melting season.

The current research was funded by an NSF grant to Richard Aronson (Dauphin Island Sea Lab) and Dan Blake (University of Illinois). Linda Ivany (Syracuse University) received separate funding to join in the research. In tandem with the morphometric studies, Ivany's geochemical work is providing climatic context for the molluscan assemblages. This was the third and final field season for the work, and this year's participants, in addition to Blake, included Alexander Glass and Kurtis Burmeister, doctoral students at Illinois, Ryan Moody, a doctoral student at Dauphin Island, and John Evans and Julian Ridley from Raytheon Polar Services.

The sediments under study were deposited during what geologists refer to as the Eocene Epoch, and Eocene cooling marked an early phase of the cooling that led to modern frigid conditions. Seymour Island contains the only extensive, fossiliferous surface exposures in Antarctica of sediments of this age, and therefore Seymour Island provides a unique opportunity to learn how climate change affected the origin of the modern Antarctic bottom fauna.

Increasing frequency of El Niño events and the continued atmospheric accumulation of greenhouse gases will probably increase upwelling on a scale of decades to centuries in some temperate coastal



Photo by Dan Blake / Special to the Antarctic Sun

*Researchers collect samples on Seymour Island.*

regions. Cool-water upwelling resulting from El Niño conditions already has been recorded off the coast of Oregon, and such upwelling might partially parallel events recorded in the Seymour Eocene sedimentary record. Recent ecological evidence suggests that lowering of sea temperatures could have profound effects on biological interactions in affected areas, altering fisheries and other resources important to humans. Understanding the response of the Seymour Island fossil faunas to global cooling will provide direct insight into potential changes in modern settings.

The Seymour Island Eocene sedimentary sequence represents a broad coastal channel, thickening toward the center of the exposure belt and dipping toward the Weddell Sea to the east. The channel, at the north end of the island, can be seen from a ship on the northeastern side of the island. Global climate change in the Eocene strongly influenced the structure of shallow water marine benthic communities in Antarctica, including this coastal channel, and these effects are still evident in living Antarctic communities. A cooling trend late in the Eocene reduced the abun-

dance of fish and crabs, which in turn reduced skeleton crushing predation pressure on invertebrates. Reduced predation pressure allowed dense populations of ophiuroids (brittlestars) and crinoids (sea lilies) to appear in shallow water settings in the upper portion of Seymour Eocene sediments. Today, dense ophiuroid and crinoid populations are common in shallow water habitats in Antarctica, but generally have been eliminated from similar habitats at temperate and tropical latitudes; their persistence on Antarctica is an important ecological legacy of climatic cooling.

Although the influence of declining predation on echinoderms is now well documented, effects of cooling on the more abundant and therefore more informative molluscan faunas had not been investigated prior to the present study. At Seymour Island, molluscan assemblages (snails and bivalves) were sampled for different moments in geologic time. Statistical and geochemical data on the fossils are used to detect time-related changes in shell form, which in turn will tell researchers how evolution adjusted to cooling and impact on marine communities.

Researchers encountered inclement weather after the first, brief reconnaissance expedition during the 2000-2001 field season. A month-long fossil-collecting trip to Seymour Island during the 2001-2002 season encountered delays due to sleet, mud, and especially high winds. Snow and ice delayed research again in Dec. 2003. Nevertheless, many thousands of specimens were collected in a detailed program that made use of a recently available topographic map and GPS technology, and these materials will allow researchers to complete their project. Fossil collections will be deposited at an as-yet-unidentified museum for future researchers. And although much of the weather this year was cold and blustery, a beautiful day on Dec. 22 (the day before departure) allowed the party to celebrate with a swim in the Southern Ocean - a much-enjoyed closing to a successful field season.

*Dan Blake is a geologist from the University of Illinois Urbana.*

# around the continent

## SOUTH POLE

### Fun stuff to do

By Vincent Scott

*South Pole correspondent*

After putting in long hours for science and construction at the Pole, people took time for some fun.

Congratulations are in order for Molly Hutsinpiller and Ryan Myhr. These athletes were the winners of The South Pole Annual Race Around the World, which was held Christmas Day. This past Sunday Hutsinpiller and Myhr were in their running shoes and were at it again – this time, however, they ran in McMurdo. The station there hosted its annual 8 km Scott Hut Race. Hutsinpiller placed first in her age group and Myhr came in sixth place for his age group. Both were excited to have participated and done so well.

It's been tournament time here lately at the Pole. On Jan. 4, Bill Riley, a construction worker from Iowa, hosted the first South Pole Poker Championship. Mike Daub co-hosted and assisted Riley, while Ethan Dicks and Chris Ogle served as dealers. The tournament lasted well into the night. At long last the poker card-sharks beat all of their opponents and emerged victorious. The poker tournament winners are: Mountain Miller in third place, Geoff Phillips in second place, and John Sample in first place. Sample is a visiting scientist from Billings, Montana, who works with the University of California at Berkeley.

The next tournament held this year was The Third Great South Pole Table Tennis Tournament. This ritual was hosted on Jan. 11 in the rock climbing gym. T. Regan organized and hosted this highly successful event.

Some players handled their paddles as deftly and as swiftly as Forrest Gump! As with the poker tournament, three winners appeared triumphant.

From first through third place respectively, our Table Tennis Tournament Tops are: Al Baker, Dar Gibson, and Kris Hayden. Congratulations to all participants.



*Fen Montaigne is a freelance writer for National Geographic. He is at Palmer Station to research a story about climate change for the magazine.*

Photo courtesy of Jordan Watson / Special to The Antarctic Sun

## PALMER

### Writer visits station

By Kerry Kells

*Palmer Station correspondent*

The *Laurence M. Gould* brought several new arrivals to the Palmer Station community and we welcome Fen Montaigne, a freelance writer for *National Geographic*. Montaigne brings 28 years of newspaper and freelance writing experience from six continents to Palmer Station. He has covered stories on political change and cultural issues as well as conservation and environmental issues. In just a week at Palmer Station, Montaigne easily has become a part of the Palmer community.

A few days ago I flipped open a 1999 *National Geographic* magazine, turned to the "Behind the Scenes" page and there was a photo and short article on Montaigne on assignment in Iran. Montaigne began his writing career as a writer and foreign correspondent for the *Philadelphia Inquirer* newspaper. He reported from Russia and was recently able to use his fluent Russian language skills to speak to crew members of the Russian ice-breaker-turned-cruise ship, the *Vavilov*, which visited our station. He has also written about the outdoors for the

*Philadelphia Inquirer* and the *Wall Street Journal*. Montaigne has traveled the planet in research for stories on the world's boreal forests, global fresh water, Atlantic salmon, Russia 10 years after the fall of the Soviet Union and Iran 20 years after the Islamic Revolution. He has three books to his credit; two are works of collaboration. "Reeling in Russia" chronicles his 100 day fly-fishing adventure across Russia from the Norwegian border to Alaska. His next article will be No. 12 for *National Geographic*.

The October issue of *National Geographic* will focus on climate change around the world. Montaigne has done research for this project already in the Alps, Hudson Bay and now Antarctica with a possible stop in Costa Rica. He believes there is no question that global warming is a reality, is human-caused and has had an effect on some ecosystems. His challenge now is to ask how global warming has affected the ecosystems of the Antarctic Peninsula. To attempt to answer this he will focus on the possible changes of a polar environment to a sub-Antarctic environment in the last 50-60 years and how this ecological change has affected plants and animals. He has accompanied

See Continent on page 6

### the week in weather

#### McMurdo Station

High: 37 F / 3 C Low: 3 F / -16 C  
Wind: 25 mph / 40 kph  
Windchill: -40 F / -40 C

#### Palmer Station

High: 45 F / 7 C Low: 30 F / -1 C  
Wind: 26 mph / 41 kph  
Windchill: 21 F / -6 C

#### South Pole Station

High: -5 F / -21 C Low: -24 F / -31 C  
Wind: 18 mph / 29 kph  
Highest physio-altitude: 3,217 m

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Bill Fraser and the seabird researchers on their visits to the different islands in the area and their studies on the seabird populations. He will also work with Tad Day's group on their studies of two native Antarctic plants and simulated climate extremes on these plants. He will talk with all the Long Term Ecological Research groups and even join a short cruise. Research here can be easily linked to his research in Hudson Bay where polar bears lost body weight and mass and decreased Arctic sea ice. Antarctic research relates to climate changes in the Austrian Alps where the glaciers are retreating and the plants species are migrating to higher altitudes. He calls time in Antarctica a "dream assignment" because of the places he has visited and the chance to come to Antarctica.

Montaigne recently met a photographer with whom he has collaborated on three previous stories. Peter Essick arrived at Palmer Station via the yacht the *S/Y Philos*. Hopefully Essick can capture, in photos, what Montaigne so easily describes in words as a place "wild and beautiful."

He describes our station as "an ideal commune and a real example of cooperation and good spirit among people." He feels privileged to join our small community at Palmer and to travel to the beautiful islands in our area.

He wants to return to Palmer Station, to come back to the landscapes of mountain ranges, islands and glaciers, a place he calls "one of a handful of utterly wild and special places on earth."

And we, too, are privileged to have Montaigne as a member of our community, a friend to the station, the community and to the environment.

## SHIPS

### ***Polar Star, Polar Sea, Gianella, American Tern***

By LCDR April Brown

*Mac Ship Ops/Coast Guard Liaison*

January 16th was a banner day for the Coast Guard in McMurdo. What seemed like almost all at once, the turning basin spilled forth the 4-meter multiyear ice boulders and heavy brash as if the gates at a horse racing track had been opened, after being stuck closed for three years. Not since the 2000/2001 season has Mactown seen open water in Winter Quarters Bay. The orca whales have returned.

Ship operations tempo is high now, and there is competition for pier space as the individual crews vie to moor up and come ashore. The tanker *Gianella* is parked just 13 km out in the channel after arriving at the ice edge under icebreaker escort. The *Palmer* is currently moored at the ice pier after fueling, and is completing science cargo offload. She will get underway on Jan. 19 for another leg of science support.

If you wondered where *Polar Star* and *Polar Sea* went, they are currently over in the vicinity of Marble Point doing a joint break-in through the 16 km of sea ice to reach a point approximately 365 meters off the beach, where the *Polar Sea* will return to later this month to refuel the helo facility. Another operation we haven't done for the last two seasons due to extreme ice conditions. The *Sea* will deliver at least 38,000 liters to the tanks there that are looking a little low these days. Fuel can be traversed over as was done last Winter, but not nearly as efficiently or in the great quantity that one big red floating gas station can deliver. Completing this mission will also signal a return to some semblance of normality

(whatever that means around here!).

The new vessel operations "plan" as laid out late last week is: *Polar Star* will slide in after the *NBP* leaves tomorrow, onload science cargo and stay inport until the morning of Jan. 21. She will get underway to make room for the *Gianella* to tie up the same day to begin fuel resupply operations. This is way ahead of schedule, as the tanker was originally scheduled to come in after the cargo vessel, but since conditions are so favorable now, what the heck, let's go for it!

The cargo vessel *American Tern* is scheduled to arrive Feb. 1 for eight days of offload operations.

### ***Nathaniel B. Palmer***

Compiled from reports  
by Ashley Lowe

The *Nathaniel B Palmer* docked at the ice pier at McMurdo Station Jan. 17. New passengers are boarding and plans call for it to depart Monday. The *Palmer* returned from collecting seismic and sonar data in the central Ross Sea.

### ***Laurence M. Gould***

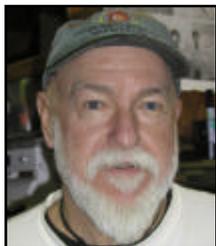
Compiled from reports  
by Andrew Nunn

The *Laurence M. Gould* was headed southward this week off the edge of the shelf, casting probes to measure water temperature and salinity.

Andrew Nunn reported, "The night shift people have settled into their sleeping schedules and you encounter far fewer zombie like stares in the wee hours of the morning, while the day-shift people are perky enough to have begun plans for crossing ceremonies, fanciful hairstyle modifications, and various bits of Photoshop skullduggery."

## Continental Drift

If you could, what would you rename McMurdo?



"It's the biggest little city on the continent."

Jesse McGill,  
Palmer FEMC  
manager from  
Franktown, Colo.,  
6 seasons



"McMud."

Tom Verville,  
Pole Fleet ops  
supervisor from  
Milton Mills, N.H.,  
15 seasons.



"The lemon stand because if life hands you lemons, you need to make lemonade."

Mark Lemon,  
McMurdo insulator  
helper from Colorado  
Springs, Colo.,  
first season.

# Polar interns get a taste of the Ice

By Brien Barnett  
*Sun staff*

Six college students have chosen to be away from school this year to intern at McMurdo Station for the season.

This is the first year for the Polar Internship Program, which seeks to eventually bring a dozen students a year to Antarctica to work and learn about the continent. The National Science Foundation supports the program through Raytheon Polar Services Company.

The interns are based only at McMurdo this year, but in the future they may be sent to South Pole, Palmer or other places, said program coordinator Jean Pennycook. The students must be enrolled for credit at one of the dozen participating universities or colleges and are required to complete a project for their institution's adviser.

This year's interns are Jaidev "J.D." Menezes from Cornell University and Matthew Betts, Erin McNulty, Jacob Randall and Brittany Sparks from Colorado Northwestern Community College. A sixth intern returned to the United States after suffering a minor injury. Six others initially were selected, but two did not meet medical requirements and four dropped out for various personal reasons.

The five remaining interns said the experience is one of a lifetime.

"When my adviser told me about it, I thought she was nuts," said Sparks, an assistant in McMurdo's dining hall. "I'm now one of the few who could say I've been to Antarctica. If I passed it up, I knew I wouldn't get another chance to get here."

The best moment for Betts was when he stepped off the plane and realized he was on the sea ice and in Antarctica.

"That was pretty special for me," said Betts, who hopes to apply some of what he learns to a career in wildlife biology. While here he's sought out Adelie penguin researcher David Ainley for some advice for his internship project.

Pennycook said one of the main goals of the program is to help people from "under-represented" racial or social groups experience Antarctica and inspire them to share their experiences with people back at home.

"They look at this and they say, 'Oh I could never do that,' and yet you could and here's the opportunity and the avenue in which you're going to do it," Pennycook said.

Menezes was born in India and moved to Toronto, Canada, three years ago with his family. He's now attending Cornell University in New York and visiting Antarctica on a student work visa.

"My dad said it was the opportunity of



Photos submitted by Jacob Randall /  
Special to The Antarctic Sun

*Above, Polar Intern Jacob Randall sits below the Wolcott Glacier in the mountains of the Royal Society Range on a trip this season. Randall has taken a year off from school at Colorado Northwestern Community College to be on the Ice this season. While here, he and the other interns are learning about Antarctica and the U.S. Antarctic Program. Randall is working as a general assistant, which often includes such jobs as cleaning the inside of rusty tanks (photo at left), shoveling snow and other chores at McMurdo Station.*



*"I'll take home a lot of bragging rights"*

**- Jacob Randall**  
about telling his friends he went snowboarding in Antarctica

many lifetimes," said Menezes, who is studying hotel management and economics at Cornell and working this season with the waste department in McMurdo.

Pennycook said Menezes is an example of an intern who is likely to carry his experience on the Ice into a different, non-science arena and that might attract new people to the Antarctic program. Pennycook and other program managers would like to see students

who are interested in careers ranging from natural sciences to political science visit Antarctica.

"It's not about coming down here to do science," Pennycook said. "I'm looking for kids who are from other areas so they'll come down here and have a different sense of this and maybe they'll be a politician or business

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## Interns From page 7

person and they'll have had this opportunity."

Interns experience the same conditions as the rest of the Antarctic program support staff, including long working hours, restricted travel and the isolation of a remote station. But they have the same opportunities to participate in station life and visit scenic and historic sites through recreation-sponsored trips. They do have to work on their project and a few are taking online courses, which means less personal time than others.

Jacob Randall is a wildland firefighter back home and a general assistant in McMurdo. He's planning a presentation about McMurdo's fire department. He said it's been a challenge balancing his job, work on the project, sleeping and finding time to relax. He made sure to get in a couple of quick turns on a snowboard, though.

"I'll take home a lot of bragging rights," Randall said about what he will be telling his friends when he returns to the U.S.

Interns are selected from a pool of interested students. They must submit an application, a resume, an essay and two letters of recommendation.

The resume isn't just for the selection process, it's actively used to get them a job in Antarctica. The resumes are sent to hiring managers. Pennycook said organizers try to place interns in a job that matches their personal and career interests.

Like most who visit, the interns' expectations of what life is like on the Ice were different from the reality. Most said although they were not used to the long work hours they thought daily living in Antarctica would be much more rugged. They were surprised by how comfortable the station is and how warm the days can be.

All of them said they hoped to see much more of the continent on special trips. Randall and Menezes have been able to go on trips off-station as part of their jobs or as volunteers. Pennycook said she'd like to see more opportunities for off-station intern-oriented trips, but acknowledged that one of the realities of the Antarctic program is that such trips are rare, even for those who have spent many seasons on the Ice.

The interns have been able to see the historic huts at Cape Royds and Cape Evans and use the recreational trails around McMurdo. They said they have a sense of the place.

"I absolutely love it. I'm so glad I came down here," said McNulty, who is from Greeley, Colo. She works with science cargo. "When I work in town I forget. When I take a walk out, I think 'I really am here.'"

Menezes said his trip to Royds created lasting memories of Antarctica for him.

"It was nice getting out of town, seeing the ice edge," Menezes said. "We sat and watched penguins for a couple of hours and toured Shackleton's hut."



Above, this year's Polar Intern group sits on top of Ob Hill. From left are J.D. Menezes, Erin McNulty, Brittany Sparks, Matthew Betts (with backpack), adviser Jean Pennycook and Jacob Randall.

At left, Menezes stands in front of the Canada Glacier near Lake Fryxell in the McMurdo Dry Valleys.

Top photo submitted by Jean Pennycook / Bottom photo submitted by J.D. Menezes / Special to The Antarctic Sun

Since this is the first year of the program, the interns are having to be flexible as the program changes, but are helping shape it for the future. They meet weekly to talk about their experiences, both good and bad. They've helped re-draft the application and will meet with next year's group in May to give advice. Pennycook also hopes they will act as mentors throughout the coming year.

Menezes suggested next year's interns read as many books about the early explorers as possible, including Shackleton's *Endurance*.

"I would suggest a laptop. I didn't bring one, but I also definitely wish I had one," he said.

He also had praise for Pennycook, who began managing the program in August.

"Jean's done an absolutely fabulous job. Anytime we need something she's there," Menezes said.

*If you have questions about the polar internship program, e-mail Jean Pennycook at [jean.pennycook@usap.gov](mailto:jean.pennycook@usap.gov) or her alternate address [jppenny@fresno.k12.ca.us](mailto:jppenny@fresno.k12.ca.us). See [www.polar.org](http://www.polar.org) for more information about living and working in Antarctica.*



Photo by Kristan Hutchison / The Antarctic Sun

*A small ice cloud forms as Patrick Ahearn, left, melts holes in the sea ice with a steam drill. The holes are used to measure ice thickness. Charles Kaminski looks on.*

## Ice From page 1

global radiation budget, it's worth it to look at this in a bit more detail," Eicken said.

That's what brought Eicken and Martin Jeffries, both professors from the University of Alaska, Fairbanks, to McMurdo to watch the ice melt and collect data from sensors frozen into the sea ice 10 months ago.

"The really interesting part for us is starting now," Eicken said. "What we're interested in is seeing how the heat goes through the ice and being able to see the meltwater."

## Freezeup

How ice melts depends partially on how it was frozen. Making sea ice isn't as simple as turning down the temperature to  $-1.89^{\circ}\text{C}$  or below. The structure and dynamics of sea ice vary based on what it goes through while freezing.

In the tumultuous Southern Ocean, granular crystals of frazil ice clump together into rounds a meter or so across with edges curled from battering into other chunks of pancake ice. The pancake ice ends up stacked, several pancakes deep, into ice floes. Then seawater often freezes, icicle-like, to the underside of the floes.

"They're long, thin crystals that grow down into the water and

they have a very different appearance from the granular frazil ice," Jeffries said.

On top of all that, snow piles onto the ice floe, depressing it until seawater swamps over the surface. The salty slush freezes on top.

The layering of crystal patterns in Antarctic sea ice leads to a unique structure and strength, Jeffries said.

"There are still certain aspects of the Antarctic sea ice cover that have not received a lot of attention" Jeffries said. "The strength of the sea ice on a variety of scales is still one that's begging to be investigated."

Walled in by continents, the Arctic Ocean has less pancake ice than the Antarctic, except in the Bering and Chukchi seas on its margins, Jeffries said. The land surrounding the Arctic tends to hold in the ice.

"It's much less easy for it to escape," Jeffries said.

Therefore Arctic Ocean ice is generally several years older and thicker than Antarctic sea ice. Antarctic sea ice is on average 30 to 50 percent thinner than Arctic sea ice. The reason relates to the annual melting pattern in the Antarctic, where the sea ice surrounding the continent is pushed north by the wind and currents, leaving behind open water for new, thinner ice to form.

## Meltdown

If you walk across the Arctic ice in the peak of summer, up to half of it is covered by melt pools a foot or two deep. In Antarctica, at the same period of summer, the sea ice remains solid white, or is fractured into pieces and blown away.

"For some reason you just don't get these melt pools at the surface," Eicken said.

In the Arctic, the darker color of the pools gathers heat from the sun, thawing the ice from the top down. While bare ice reflects 65 percent of sunlight, ice spotted with melt pools reflects only 30 to 50 percent, Eicken said.

"By adding melt pools you can more than double the amount of solar heating of the ice cover," Eicken said. "It's almost like spreading soot. It really helps absorb radiation."

In the Antarctic, snow usually covers the sea ice, reflecting 75 percent of the sunlight. Most melting occurs on the edges and bottom of an ice floe. At the same time, the sea ice is broken up by the ocean waves and blown north.

The conventional wisdom explaining the presence of Arctic melt pools says that dust blows onto the ice from the surrounding land masses and triggers the surface melting.

The Antarctic is the opposite, with cold, dry, clean air blowing off the glacial continent and out to sea.

"There's very little source of sediments or dust or dirt. As a result, the ice surface actually can stay very cold, even in summer time," Eicken said. "Obviously, this explanation is a pretty good one, but it doesn't explain everything."

**See Ice on page 10**

## Salty ice makes room for life

How heavily salted the ice is may also change the melting process. The melting of snow in the Arctic washes salt out of the ice, decreasing the overall salinity. The Antarctic ice doesn't get washed by snow melt, and instead ends up with highly saline layers of seawater freezing on top when heavy snow dunks an ice floe. As a result, Antarctic sea ice is saltier by 1 to 2 parts per thousand than the Arctic.

"It is actually quite a large difference," said Martin Jeffries.

The saltier ice develops brine channels through it from 100 micrometers to a millimeter in diameter. Those tubes of brine may warm and melt through the ice, moving heat from one part of the ice to another. They also provide a habitat for microscopic plants and animals, particularly diatoms which sometimes stain the ice a dark brownish green.



Photo by Kristan Hutchison / The Antarctic Sun

*Hajo Eicken kneels to read the depth on a measuring tape dropped through a hole in the ice while Martin Jeffries tends the steam drill behind him.*

## Kinds of ice

**Frazil ice:** millimeter-sized granular crystals of ice floating on the surface. These give a sheen to the water often referred to as grease ice.

**Pancake ice:** Rounds of floating ice several meters across with edges curled up from colliding with other ice chunks. These develop only in open water, with its combination of cold, wind and waves.

**Congelation ice:** Icicle-like crystals several centimeters long and up to 30 mm wide hanging from the underside of the ice.

**Platelet ice:** Plate-like ice forming deep in protected waters. They can be up to handsized, made up of crystals 1 mm to 2 mm thick. These float up and freeze to the base of the ice above.

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The rapid disintegration of the Larsen B Ice Shelf in 2002 involved large melt pools on top of the ice. That suggests the pools may not be caused by dust collecting on the surface.

"If all this is true, these places should be the last places with melt pools," Eicken said. "That does suggest that there may be substantial changes in the way the ice melts or in the surface energy balance."

When Eicken was in McMurdo last year, he took cores from the third-year sea ice to look back through several years of history.

"I thought whoa, this really looks like ice melt in the Arctic," Eicken said. "All of the signs of how you would expect surface melt to occur in the Arctic, we found traces of that in McMurdo Sound."

### Is it shrinking?

Whether Antarctic sea ice has been shrinking or growing overall depends on the timescale in question.

Satellite photos taken since the 1970s show there was a dramatic loss of sea ice between 1973 and 1977. Since then the sea ice has increased, with the exception of the area immediately west of the peninsula. There, ice in the Bellingshausen Sea appears to have shrunk due to warming along the west shore of the peninsula, where average temperatures have risen 3C in the past 50 years. Overall, Antarctic sea ice declined by an average of 150,000 square kilometers per decade from 1972 to 2002.

Going back earlier than that, the record for sea ice is pretty scant, Eicken said.

A research paper published in November in *Science* suggested the sea ice around Antarctica has shrunk 20 percent in the past 50 years. The theory is based on increases in sulfur compounds found in ice core from Law Dome near Australia's Casey Station. The sulfur compound is produced by marine algae, so the quantity in any year's snowfall is a clue to the extent of the ice.

"The picture is a little murky," Jeffries said.

On the other side of the world, the picture is much clearer.

"There is very strong evidence that the sea ice in the Arctic Ocean is significantly thinner than it was 30 to 40 years ago and there is a smaller area of ice, so there's been a significant loss of ice in the Arctic Ocean," Jeffries said.

Some of the first evidence came from Alaska Inuits, who noticed the Arctic ice was changing.

"Those people who hunt out on the ice, they have a very, very good understanding of what's going on," Eicken said. "You basically learn what a scientist would, it's just your interpretations differ and the problem is record keeping."

Since then, research and satellite photos confirmed that the Arctic sea ice has decreased twice as fast as the Antarctic.

Several possible theories explain the differing sea ice changes in the northern and southern polar regions. To start with, the poles are far apart with different weather and climate patterns, Jeffries said. The climate cycles affecting one may never touch the other. Also, climate change models indicate the effects of global warming will be felt first and more strongly in the Arctic.

"The things that are happening in the Arctic are sort of what climate models have been predicting might happen," Jeffries said.

The Arctic sea ice cover is shrinking so rapidly that some models show it could melt away completely in the summer in another 50 years, Eicken said. That would make the Arctic sea ice more like the Antarctic, which grows by 14 million square km each winter and then retreats back nearly to the continent's edge over the summer.

On the other hand, if climate change led to more snow on top of the Arctic sea ice, so that it reflected more sunlight the way the Antarctic does, the melt pools might not appear anymore and the summer melting would slow, Eicken said.

"There's more to the story," he said. "Maybe we are changing something about the way the snow cover behaves on the surface."



Photo by Scott Metcalfe / Special to The Antarctic Sun

John Wright inscribes his name on a post marking the southernmost point of the traverse this season, having gone 690 km.

## Traverse From page 1

south they could get.

The caravan turned around Dec. 30, short of half-way to the South Pole. In 43 days they had gone 690 km south, 480 km farther than last year. Despite the difficulties, they accomplished their primary goal to test the traverse concept while traveling as far south as possible. Now back at the Shear Zone, they return to McMurdo with clear understandings of which vehicles and other pieces of equipment did or didn't work, and also with an idea of the terrain they face.

"This is a place that no one else has ever been," Metcalfe said.

The basic concept of creating a trail that will be easier to travel has worked. They left a compacted trail 6 meters wide marked with green flags every half kilometer. Along the way they checked that the route was crevasse free for 6 meters on either side.

While the journey south was slow going, sometimes only about 15 km a day, the return has been much faster. On the first day north the vehicles went 75 km, almost twice the distance they could have done breaking trail to the south. It helped that they were pulling lighter loads and did not have to shuttle cargo, Wright wrote.

"The ultimate cause for our improved performance, however, is the crudely groomed snow surface we built behind us as we broke trail heading south," Wright wrote. "We had no expectation that our efforts would work as well as it appears to

be doing now, given the horrid snow conditions we faced southward ... but we are delighted."

### Snow swamp

The southward journey was bogged down by a 300 km section of deep powder snow they referred to as the snow swamp. Though Antarctica is frozen, it rarely snows, so running into snow two meters deep and the consistency of sugar surprised the traverse team.

"We sink into this stuff and stir it up as soon as we're on it – right up to the belly pans," Wright wrote.

For the short time they were with the traverse, Metcalfe and Bert Yankielun from the Cold Regions Research and Engineering Lab dug snow pits every day at 6 p.m. They found 10 layers of snow in the pits, getting colder and more granular as they descended through the layers. "That could be 10 years of snow," Metcalfe said.

The granular snow wouldn't pack and provided little traction for the vehicles. Almost daily a sled or tractor would become stuck and need to be pulled out by the other tractors. Unseasonably high temperatures, sometimes up to 4C, worsened the snow.

"The warmer weather makes for soft snow surfaces," Wright wrote. "We sink pretty deep into this snow."

Instead of gliding on top of the snow, the sleds ended up plowing through it,

"We're not power limited here, we're traction limited."  
- John Wright

pushing mounds of the snow in front of them. Eventually the pins holding the skis to the sled snapped. The pins had to be replaced and chains were used to secure the skis. The chains also broke under the strain. Though the snow surface was flat, occasionally old sastrugi were hidden under the snow.

"There is very little visual clue that these bear traps are out here, but when we go over one, we fall into the fluff on the back side of them and frequently get stuck," Wright wrote.

The traverse fleet included three tractors: a Case QuadTrack, a Cat Challenger-95E with a Fassi crane, and a Kress Modified Challenger-95E. While the Case and Cat proved to be almost as stalwart as the men, the Kress was soon recognized as a "fuel burning encumbrance." It had a tendency to rear up, digging deeply with the rear wheels. The two trailers of fuel the Kress started out pulling had to be cached early in the journey. In the deep snow the Case tractor went from pulling five fuel tank sleds to barely pulling two. The Cat went from two sleds to one.

"We're not power limited here, we're traction limited," Wright wrote.

When problems arose, the crew found a way to solve them, sticking to their motto "all is well."

"We're talking about complete hitches breaking and they're arc welding it on the spot," Metcalfe said. "This is a dedicated group of well-oiled machines. None could do better. John Wright shows incredible leadership skills."

The traverse drove at night, running 12 or more hours in the constant sunlight seven days a week. The living quarters were set up with all the necessities of life and none of the luxuries. Up to eight men lived together in a space the size of a shipping container. They had daily showers and heated pre-made meals in the microwave. An Iridium phone allowed them to check e-mail. But there was no time for recreation. Though someone brought a kite, "we didn't fly it because we were too tired," Metcalfe said.

The traverse crew is working at the Shear Zone this week and expect to arrive back at McMurdo prior to Feb. 1. Then they'll re-examine plans for next year, which had been to make it all the way to the South Pole and back.

"They're going to do a lot of things differently," Metcalfe said.

# Profile Out of her comfort zone

By Kris Kuenning

*Sun Staff*

Susan Weber used to make the big decisions for big corporations. Now the Michigan native is scrubbing toilets at the South Pole.

"I like to put myself in totally new situations," she said. "I need that. It's not easy, but I think it's good for you."

It's not the first time the adventurous 49-year-old has instigated dramatic changes in her life.

Her last corporate job was business development manager for a large oil company. Based in Moscow for two years, she traveled much of Russia by train.

That time changed her and made her long for a simpler life.

"When the project finished there I went back to the States. There were no other projects that really interested me so I asked for a year leave-of-absence."

Her company gave her six months. When it was up, she resigned.

She had found a new application for her business skills, helping to run a dog mushing business in Minnesota.

"It was more intriguing because it was new to me," Weber said. "The dogs are my favorite for sure."

A few years ago, one of Weber's dog-handlers was receiving regular e-mail and photos from a friend at McMurdo Station.

"That's how I learned that a 'regular' person could come down here," she said. "I've always been fascinated by the continent. I've read everything I could find. I'm fascinated by winter – the cold, the snow, the space, the empty expanse – I'm captivated by all that."

When she made up her mind to apply for a job, she was willing to do whatever it took.

"I would have worked anywhere on the continent, doing anything," she said.

In April 2003, Weber flew down to the Raytheon Polar Services job fair in Denver. She wanted to be there in person because she felt her experience wasn't good "on paper."

South Pole area manager BK Grant talked to Weber at the job fair.

"I liked her diverse background ... what an interesting professional path," Grant remembered. "And she seemed like she was willing to take on a bit of a challenge. She had a great attitude and asked lots of questions, which indicated she really was thinking about what it would take to be here and work here."

Weber flew home from the fair on a Saturday. Grant called the following



Photos by Kris Kuenning / The Antarctic Sun



*Susan Weber left behind a mushing business to be a janitor at the South Pole this season. Above, cargo handler Amanda Betz gives Weber an Antarctic-style mushing experience.*

*Left: Weber volunteers to help make the week's supply of bagels.*

"Everything is not the way I thought it would be," Weber said. "Everything is not as easy as I thought it would be."

Passing through McMurdo, Weber absorbed the history by visiting early explorer's huts.

"McMurdo was more special than I imagined," she said. The South Pole, she said, has a different kind of beauty, one she wasn't prepared for.

"I love it here now ... that never-ending whiteness and the snow patterns."

Now, she said she is starting to look forward to the flight out of Antarctica and the realizations that leaving will bring.

"It's pretty overwhelming to come here," she said, but she's not sure if she'll try to return.

"I'm leaving that open because I think it's a process. It feels so differently now than it did five or six weeks ago."

Weber is willing to go wherever that process takes her.

"I changed so much when I lived in Russia as to how I wanted to live," she said. "Maybe it will happen again. I decided I wanted to experience some of those other opportunities and from this there could be some other revelation."

Monday to offer her the janitor position at South Pole and the next day Weber said "yes."

"I called my parents and told them, 'I have big news. It's good.' When I told them, my mother was dead silent but my father said 'that's great!'" Weber said. "My father is my biggest supporter in this venture. My parents are extensive travelers. This is the only continent they haven't been to, so they're getting a kick out of my visit."

With her aging parents still in good health, Weber felt the opportunity to come to Antarctica was now.

At the South Pole, Weber is making the most of her experience. In her free time, she works in the store and the greenhouse or helps prepare the week's bagels in the kitchen. She jumps at every opportunity to help science groups or explore the station.