December 11, 2005

The Antarctic Sun

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Want pickles with that?

Emily Stone / *The Antarctic Sun*

Edith Day prepares for lunch by testing the temperature of cheese and meat on the sandwich line in the McMurdo Station dining hall. Cooking in Antarctica can be a challenge — ingredients are ordered months before they're used, fresh food can be scarce and cooks at the three U.S. stations are trying to cater to between dozens and a thousand people. Read about how Antarctic chefs keep the station workers fed in an article on page 7.

Tractor lovers form club

By Emily Stone
Sun staff

When you hear an Antarctic worker talk about his sweetheart, don't assume he's referring to his girl back home. Sometimes he's affectionately discussing his tractor.

Massive tractors are the muscle that built the Antarctic stations. The old ones, including three Caterpillar stretch D-8s from the 1950s that are still used at McMurdo Station, have earned the respect of the people who drive them. But heavy equipment operators aren't the only ones who admire old tractors. Others on station brought their love of the machines with them to the Ice.

The Antique Tractor Club is a new group at McMurdo for tractor enthusiasts. The group has met twice to watch old tractor movies. Steve Petraitis, the power plant mechanic who started the group, hopes they meet a couple more times this summer. He would like to see the get-togethers eventually include presentations by tractor enthusiasts and collectors.

"I've always been interested in tractors," said Petraitis, who grew up working on a farm in Connecticut and has 25 years of experience working on Caterpillars. "I've been messing with them since I was a boy."

Petraitis' "pride and joy" is a 1954 Caterpillar D-2, built the same year he was

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Piecing together Earth's tectonic past

By Emily Stone
Sun staff

Anyone who has hovered over a jigsaw puzzle for hours knows that sometimes you can't figure out how two pieces fit together until you've placed all the pieces around them.

The same holds true for Earth's tectonic plates. Understanding how the Antarctic plate fits in with its neighbors, and how that has changed over millions of years, helps geologists put together puzzle pieces as far away as Hawaii and Iceland or along the San Andreas Fault in the United States.

A team of scientists is hoping to add to the understanding of the important Antarctic plate during two cruises between McMurdo Station, South America and New Zealand. They will use underwater instruments to make a more detailed map of the plate, and see where it used to be joined to other continents.

"Essentially, what we're trying to do is sort out the plate tectonic history of Antarctica," said Joann Stock, principal investigator on the project's first cruise and

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Quote of the Week

"You don't want to be the one to find out."

— Man wondering if aggressive skuas want to scare you or eat your eyeballs.

Inside

Cold, hard facts

Juicing the numbers

(McMurdo power and water plants)

Largest number of hours on a power plant generator: **110,500 — if you drove a car at 90 kph for this long, you would have driven more than 9.5 million kilometers**

Per day water use so far this summer divided between each person: **240 liters**

Size of the smallest water filter: **5 microns, about a tenth the width of a human hair**

Biggest water users: **Dining facility and fleet operations; fleet ops spreads fresh water on the runway and roads to create more durable ice**

Size of potable water tanks: **750,000 liters**

Amount of water held in reserve for fighting fire: **380,000 liters**

Source: McMurdo power and water plant staff

Back in the day ...

Courtesy of U.S. Navy / Special to *The Antarctic Sun*

Lt. junior grade Jack Tuck uses a sled dog team to cross the sea ice near where McMurdo Station is located today in this 1956 photo. This month marks the 50th anniversary of Operation Deep Freeze, when the U.S. Navy built an airfield at McMurdo to serve the planes that would fly to the South Pole to establish a station there. Dogs and other non-indigenous animals were banned from the continent with the Antarctic Conservation Act of 1978.

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Level 1 Comix **Matt Davidson**

AST/RO ends 11 successful years at Pole

By Steven Profaizer
Sun staff

Some things only get better with age. Others just get replaced.

The latter is the case with the Antarctic Submillimeter Telescope and Remote Observatory, or AST/RO. Scientists are currently dismantling the 1.7-meter radio telescope, after almost 11 years of searching the sky, to make room for its larger and more advanced successor, the 10-meter South Pole Telescope.

"It's a little sad to have it all come to an end," said Antony Stark, who has been with the AST/RO project since its beginnings in the 1990s. "But I am excited about the new possibilities with the 10-meter telescope."

Scientists didn't expect AST/RO, intended simply as a prototype for the new telescope, to have the 11-year lifespan it did.

"We couldn't have the 10-meter without AST/RO," Stark said. "A lot of people didn't believe these types of observations could be done. We were allowed to try it with AST/RO because it is small. It gave us a chance to prove the concept."

The South Pole is an exceptional location for radio telescopes because the cold temperatures prevent view-obstructing water vapor from lingering in the atmosphere.

"Unfortunately, it's not as clear as observing from space would be," Stark said. "But it's much cheaper — at least by 500 times."

AST/RO has completed scanning about 10 square degrees of space, which is about 50 times the area of the moon as it appears from Earth. While this represents only 0.001 percent of the sky visible from the South Pole, it was the most interesting 10 degrees the scientists knew to study with this size telescope, Stark said. Scientists will need much larger telescopes to study most of the other "really interesting" areas in the sky with adequate resolution.

Simply put, space is big. Each of the approximately 8,000 square degrees of sky over the Pole potentially contains huge amounts of information, Stark said.

Most of the telescope's efforts have been focused on star-forming regions near the sun and in the center of the Milky Way Galaxy. Even in its final year, AST/RO continued helping scientists learn more about the inner workings of the galaxy. Researchers used the data collected this winter to examine the black hole in the center of the Milky Way by studying the dense gas encircling it and the forces slowly pulling the entire galaxy toward its dark center.

The group's 2005 winter scientists, Andrea Loehr and Steven Parshley, worked with 2004 winter scientist Nick Tothill to perform observations in collaboration with the Spitzer Space Telescope, the largest infrared telescope ever launched into space, as well as many other instruments observing the star-forming regions near the sun.

The data gathered by the telescope also serves to feed computer models trying to help answer some of the mysteries of the cosmos.

"Models by themselves would spin off into fantasy without being tied to the type of observations we help provide," Stark said.

The telescope will leave the South Pole this season, but it is not clear exactly where it is headed.

Stark would like to find a home where AST/RO could continue its work, but finding the financial backing to pay the annual bill, which runs the better part of a million dollars, may keep that from happening.

There are several other possibilities for AST/RO's future, including becoming a training tool for students or being cannibalized for parts to contribute to other projects.

"The likelihood is that we will have to mothball it," Stark said. "We'll extract the parts that are still useful and junk the rest."

NSF-funded research in this story: Antony Stark, Harvard-Smithsonian Center for Astrophysics, http://cfa-www.harvard.edu/astro

Jacob Kooi / Special to *The Antarctic Sun*

AST/RO sits below a solar eclipse in February 2000. The telescope is being dismantled this season to make way for its 10-meter successor.

Courtesy of Antony Stark / Special to *The Antarctic Sun*

AST/RO is lifted by a crane as scientists prepare the telescope to leave the continent.

Perspectives

Lesson Learned:
Don't pick a fight with a sea star

Dominique Cowart
Special to the Sun

I've gained a new respect for sea stars.

They don't look very intimidating when you see one for the first time. But you would be surprised at what they are capable of.

I always had the idea that starfish were naturally docile animals, that they moved very slowly, prancing about the sea floor on their tube feet as carefully as they pleased. Like many people, I was fooled by their appearance of sensitivity and flimsiness, mistaking them for a delicate creature. After all, they are at most only the size of my palm.

In August, I found out otherwise.

I began researching sea stars as part of a team from the University of Delaware Graduate College of Marine Studies. The team is headed by Adam Marsh and consisted of three Ph.D. students, one masters student, and myself, a recent graduate from Texas A&M University at Galveston. We arrived at McMurdo Station in late August, in time to catch the species of Antarctic sea star (*Odontaster validus*) and sea urchin (*Sterechinus neumayeri*) in the process of reproducing.

Scuba divers from our team ventured into holes just over a meter wide that had been drilled in the sea ice, and collected the animals. We brought the stars and urchins back to the lab and allowed them to release eggs and sperm, a process known as spawning. We then mixed the sperm with eggs to create embryos. We recorded and observed the growth of the embryos.

We looked at the effects of the Antarctic environment on the development of the stars and urchins. Due to the extreme cold, these animals tend to develop slower than their warm-water counterparts. We study their embryos because they tend to be more sensitive to change than adult sea stars and urchins.

My job was to observe the effects of salinity changes on the embryos by engineering a "nursery" from a plastic well plate. The embryos were placed in 96 individual wells, which are tiny bowl-shaped containers. Cold water was pumped under the plate to keep the temperature of the water in the wells the same as the temperature of the environment the embryos normally develop in.

Courtesy of Dominique Cowart / Special to *The Antarctic Sun*

Dominique Cowart gained a new respect for the hardiness of sea stars following a research season in Antarctica studying the invertebrates.

speaking of science...

The water in the wells was set at different salinities. Half the wells are the saltiness of McMurdo Sound, and the other half have a more diluted salinity. I was able to observe and track the development of 96 embryos at one time and collect valuable data from the observations.

It is a splendid global change experiment. We may be able to understand salinity tolerances of these animals should massive global warming cause the ice sheets to melt, thus diluting the oceans' salinity.

So what on earth would lead me to believe that sea stars are some of the toughest animals in Antarctica?

Well, I would go into the aquarium and see a cluster of sea stars rolled into a ball. Mating? No. Stretching? Perhaps. It so happens that they are rolled around something. We found that they were not practicing a perfected gymnastic routine or a synchronized swimming demonstration. They were feeding on a victim — more than likely a sea urchin, which is about the same size as a single sea star.

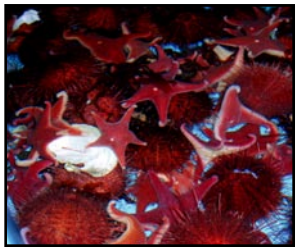
On other occasions, there would be a sea star sitting in the water table, minding its own business. For a split second I'd look away and turn to find the star had changed position. It seems as if they moved like a watched pot boils. Nothing one second, then the next moment they are somewhere completely different. And I thought the highlight of their day was sitting in one place.

What I found in my three months at McMurdo was that sea stars possess characteristics one would think necessary for living in water that's practically freezing: they are hardy, tough, and seem to eat anything.

After completing several trials and analyses of the embryos, I also found that not only were adult sea stars mighty, their babies were resilient as well. It was impressive to see that the sea star babies continued to develop, even when an important environmental stress, such as a change of salinity, was placed upon them.

I've come home now, and like many others who venture to Antarctica, it's hard for people to believe that I've been there. They ask me the usual: how cold was it, and what I did there. My response is: penguins are nice; seals are cool … but I'll pick a sea star to fight my battles any day.

Dominique A. Cowart was in Antarctica for the first time as a part of Adam Marsh's work with marine invertebrates. She's planning to attend graduate school at the University of Delaware.



A tank full of sea stars and sea urchins in the Crary lab.

Courtesy of Dominique Cowart / Special to *The Antarctic Sun*

around the continent

SOUTH POLE

Weather stops flights

By Katie Hess
South Pole correspondent

The mercury soared at the South Pole this week, with temperatures hitting a high of negative 25 degrees Celsius on Dec. 4 as summer really came into its own.

On Dec. 6, weather dominated by northwest winds brought us this warmer weather reminiscent of coastal storms. As freezing fog rolled in, Polies delighted in small ice crystals that formed outside.

Unfortunately, flight activity flagged when the weather took a turn for the worse. Six LC-130s were scheduled to fly that day, but no plane was able to land in the socked-in weather. Antarctic weather is famously fickle: weather at Pole cleared just in time for gusting winds to pick up the next day in McMurdo, prohibiting flights out of there for another day.

The lack of flight activity has not made us any less busy. On the science side, we worked on the South Pole 10-meter Telescope; put some final touches on the Background Imaging of Cosmic Extragalactic Polarization telescope installation; set ice top tanks (involves freezing water with as small and as few bubbles as possible) for the IceCube project; and closed down Skylab, the science building.

On the operations end, we further excavated the BioMed Arch; raised the new high-frequency antennae; and began moving cargo, do not freeze (DNF) and cryogenics facilities to a temporary pad downwind of the elevated station.

On the 7th, logistics operations were temporarily moved into the Dome so that the cargo office building could be dug out and moved up onto a raised platform of snow. Raising the buildings higher will decrease much of the drifting and snow removal operations around this site for the next few years. The operation also moves the cargo office and DNF building into closer proximity with the flight deck, where cargo is off-loaded from the planes.

John "Scot" Jackson / Special to *The Antarctic Sun*

The South Pole cargo office is moved from its current location near the garage arch. It is being relocated closer to the airfield on a raised snow pad to prevent drift accumulation. The move is also expected to help with the off-load of cargo from planes.

The meteorology department continues to generate action at the South Pole by soliciting volunteer help for the annual measurements of six snow-stake lines. Each line has 40 stakes at half-kilometer intervals that terminate 20 kilometers from the station. This is a snow accumulation study managed by Ellen Mosley-Thompson from Ohio State University, and data collection has been going on for 11 years.

Traveling away from the hubbub of science and construction activity, beyond sight of the station, really feels like going out into the middle of nowhere on the last continent. Measurements for each line in the hexagonal pattern take about six hours in a PistenBully. On a snowmobile, it takes about four to five hours. Occasionally, the PistenBully will break down, and then the only option is a 20-kilometer ride on a snowmobile, which some people swear is more fun than the PistenBully.

"Either way you do it, everyone seems to enjoy getting away from it all … and there is never a shortage of volunteers for the ride," said Don Jeter, South Pole meteorology supervisor.

For the more rugged Polies who crave learning about outdoor life on the polar plateau, the Field Safety Training Program is providing overnight classes that focus on becoming comfortable with survival gear and being away from the station. Classes are taught on a first-come, first-served basis. The first weekend session this summer was a great success, and the second of three heads out this weekend for the truly adventurous.

PALMER

Projects with plants

By Kerry Kells
Palmer correspondent

Open water this past week allowed station science groups to take out the boats for sampling and research. Our resupply and

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the week in weather: Dec. 2-8

McMurdo Station
High: 42F / 5C
Low: 17F / -8C
Max. sustained wind: 51mph / 81kph
Windchill: -24F / -31C

Palmer Station
High: 43F / 5C
Low: 25F / -5C
Max. sustained wind: 26mph / 42kph
Precipitation: 0mm

South Pole Station
High: -12F / -24C
Low: -24F / -31C
Peak wind: 29mph / 47kph
Max. Physio-altitude: 3,139m

Continent From page 5

Cara Sucher / Special to *The Antarctic Sun*

The landscape around Palmer Station is attractive to scientists and tourists.

research vessel, the *Laurence M. Gould*, arrived with science cargo and new arrivals. It then departed for a research cruise.

On Nov. 30, Sarah Strauss presented our Wednesday science lecture. Strauss is a Ph.D. student with Tad Day and Chris Ruhland's terrestrial ecology group. While Strauss is here, she will begin research for her Ph.D. thesis at Arizona State University. She will research soil development (how primary minerals create soil with organic matter added) at recently de-glaciated sites near Palmer Station.

Global warming research conducted on the Peninsula indicates that rising temperatures in the last 50 years have caused glacial melting. Before 1945, studies show that glacier retreat was limited to just north of 64 degrees south, but now 87 percent of glaciers are retreating along the Peninsula, which extends to 63 degrees south.

Strauss' research sites in the Palmer vicinity include several rocky areas recently uncovered by the retreating glacier. Stepping Stone Island is the control area. It has a three- to five-centimeter-thick layer of organic soil, and plants have been colonized there for some time. Strauss will take measurements and collect samples to determine soil characteristics, among other things. She will study plant abundance, net mineralization rates (the nitrogen cycle activity level) and litter decomposition rates (how active the soil microbes are in decomposition).

The area known as Point 8, which is about 40 meters long, is especially significant. Research shows there were 94 *Deschampsia antarctica,* commonly known as hair grass, plants there in 1999 and more than 5,000 in 2004. However, plant colonization at two other sites, which have been de-glaciated for about the same amount of time, seems to be occurring more slowly. All sites have similar climates and topography and contain *D. antarctica,* as well as similar mosses and lichens. Strauss will study the factors that contribute to the slower development of plants at the de-glaciated sites.

During the past week, the sea bird researchers continued work on the nearby islands of Torgersen, Humble, Cormorant, Christine and Litchfield, where they monitor Adelie penguins, brown skuas and snow cover. Work began on Shortcut Island where a south polar skua population is monitored during the nesting season. At this time of year, the birds are still arriving and have yet to set up nests.

The birders, as the group is called, also began working with giant petrels, which are large sea birds related to the albatross. The researchers placed satellite transmitters on a number of the giant petrels to study their foraging patterns. They made an attempt to reach Biscoe Point, where the only nearby gentoo penguins are located, but the thick sea ice halted the trip. They will continue to study the local ecosystem and how climate changes affect the skuas, petrels and penguins.

SHIPS

LMG

Compiled from reports by Stephanie Suhr

Marine Projects coordinator

Thick ice once again stood between the *Laurence M. Gould* and Palmer Station as the ship approached within about 90 kilometers, crawling along at less than 4 kph, on Dec. 1. With the ice only getting thicker, we decided to turn around and take the inside route through the Neumayer Channel, finally making it to Palmer by 6 p.m. The cargo off-load was completed within about four hours.

After the cargo was unloaded, the cruise setup was finalized while we anchored in Arthur Harbor. We left Arthur Harbor the next day and made our way to the study area off the tip of the Antarctic Peninsula through the Gerlache and Bransfield straits. The weather was a bit rough, but we kept a good speed.

We spent the 3rd looking for the elusive iceberg, A-52, as it was nowhere to be seen around the area where it was located two days ago, according to satellite images.

Late in the evening, we finally caught up with it. It is huge! It's a massive tabular berg, about 20 kilometers at its widest point and 30 meters high, with an oval shape, jagged edges and of the most intense blue color. This is most likely a piece that broke off the Larsen Ice Shelf when it collapsed four years ago, and it seems to be drifting in the direction of the Scotia Sea at several kilometers per hour.

We deployed the transducer pole with the Biosonics sonar the next morning, and began a slow tour around the iceberg in a clockwise direction to try to image its subsurface area. Later in the morning, with the weather picking up and the data being very noisy, it was time for a change of plans. We recovered the pole and did a total of four conductivity, temperature and depth (CTD) casts instead, followed by a plankton net tow. All this time, the bird and mammal survey had been going on very successfully.

Later the next morning, we attempted to deploy the Multiple Opening/Closing Net and Environmental Sampling System (MOCNESS), a sophisticated net sampling system. The procedure had to be abandoned due to problems with the electronics. Eventually, we started a circumnavigation of the iceberg at full speed to get an outline of its contours, which will help in planning our over-the-side deployments.

We completed the circumnavigation in the wee hours of the morning the next day, and followed that with a couple of CTD casts. We then headed around to the lee side of the berg and deployed equipment, which revealed that the subsurface area of this iceberg is a plain, vertical face similar to the area above the surface. This is not what we are looking for, so we abandoned berg A-52 to look for a more suitable iceberg to study.

NBP

Compiled from reports by Alice Doyle

Marine Projects coordinator

We began heading north and homeward from the Ross Ice Shelf on Nov. 30. The final day's work in the area included all the usual suspects, from net tows to Zodiac deployments. The winds had picked up a bit from yesterday, giving ideal conditions to look for upper layer mixing, a goal of the cruise.

The ice is definitely thinner heading back north than it was as we came south (as expected). The ice images indicate that we will probably encounter thicker ice as we move northward. We stopped briefly on Dec. 1 to conduct a shallow conductivity, temperature and depth (CTD) cast to collect surface water for some ongoing experiments.

We conducted one more ice core sampling session on Dec. 3. As with the ice collected earlier in the cruise farther south, this ice was teaming with algae of various sorts. Overall, the ice is looking more "rotten" than on the southbound trip. The temperatures are warmer, but the winds remain high.

Ice remained quite thick throughout most of the next day. We stopped midday to conduct a deep CTD cast to collect water, straighten out the wire and most importantly to shrink Styrofoam cups. The CTD went down with so many cups on it that we thought we were going to have to add more weight.

We continued north to Lyttelton, New Zealand, the next couple of days, enjoying fair conditions and rising temperatures.

Feeding the hungry Antarctic masses

Photos by Emily Stone / *The Antarctic Sun*

Top, McMurdo baker Douglas Peterson makes chocolate chip cookie bars in the station kitchen. Homemade desserts and breads are offered every day.
Above, vegetarian production cook Camille Frost ladles beans into a tray of rice. Vegetarian entrees are offered at each meal.
Left, sous chef Roger Harvey cuts packages of ground beef, which he'll use later to make pasta sauce.

By Emily Stone
Sun staff

Antarctic workers may sacrifice time with family, private rooms and cable TV to be here. But there are certain things they can't do without — like cookie day.

"If we change that, it'd be mutiny," said Executive Chef Sally Ayotte of the McMurdo Station tradition of baking 3,000 cookies for lunch every Wednesday.

Cooking in Antarctica is a challenge. Food is ordered months and sometimes more than a year before it's used, fresh ingredients can be scarce, and the chefs at the three stations cook for between a few dozen and 1,000 different palates.

But the task is also hugely important, beyond the obvious nutritional needs of people working in the cold. Meals are an opportunity to make people feel cared for and at home during their time away from the normal creature comforts of the "real world."

"There's that philosophy that you can't please all the people all the time," said Wendy Beeler, the South Pole food services supervisor. "We try anyways."

For a reminder of how valued good food is in Antarctica, take a look at the Thanksgiving meal intake. At McMurdo, the holiday dinner was roughly the equivalent of three days worth of food, and there were few leftovers. At Palmer Station, where community members pitch in to make desserts for the feast, there were 33 pies for 36 people.

At a typical McMurdo lunch and dinner, there are always two meat dishes and a vegetarian entree, plus a starch, vegetable, cold salads and soup, with homemade bread at dinner. Pole and Palmer have a scaled back menu for their smaller populations — about 250 at Pole and 40 at Palmer during the summer — with usually one meat and one veggie option, plus a starch, vegetable and bread. Desserts are plentiful and popular at all three stations.

At McMurdo, steak night is always a hit, Ayotte said. The kitchen will go through about 270 kilograms of steak, compared to 90 kilograms of pork when that's the evening's main meat choice.

"People love their beef," said Ayotte, who oversees the kitchens at all three stations.

Mexican food is a favorite at Palmer and Pole, with other types of ethnic food close behind. Beeler said the best dish is often simply each chef's favorite creation.

"Whatever the cooks love making, people can taste that," she said.

The chefs say they work to create bal-

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Station food needs vary depending on weather

From page 7

anced meals instead of focusing on the workers' calorie needs.

An outside worker at McMurdo goes through about 3,000 to 4,000 calories a day, while an inside worker eats 2,000 to 3,000, Ayotte said. Most people, she said, go a little nuts when they first arrive and see a big buffet three times a day. Then, after a month or so, their pants start to get a bit tight and they scale back.

Not so at the South Pole, where the extreme cold can lead to a daily intake of 5,000 to 6,000 calories, said Ayotte, who spent six years cooking there before coming to McMurdo. She saw people put away five steaks in one sitting.

"It was frightening," she said.

Palmer has the opposite problem. The summer temperatures usually hover around freezing, so people generally have to watch what they eat to avoid gaining weight.

"It's not like Pole where you can eat everything you want and still lose 20 pounds," said Palmer Food Services Supervisor Marge Bolton.

Each station uses a five-week menu to plan meals. The chefs try to ensure there's enough variety to keep people happy without getting so radical that people who crave basic staples get unhappy.

"There are definitely times you have to curb the creativity to please most of the crowd," Ayotte said. Spicy dishes and unusual flavor combinations might be appropriate occasionally, but aren't the standard.

The food services supervisors at the three stations look at the record of what people have eaten in previous years to figure out what to order each year. They are budgeted with a little less than $9 per person per day, Ayotte said.

People's tastes stay fairly consistent, but there are some surprises each year. Like the cereal at Palmer Station, Bolton said.

"Some years, one brand will be really popular. The next year we order more of that and everybody decides they want Raisin Bran," she said.

The supervisors place their food order in June. At McMurdo and Pole, that food goes on the annual resupply vessel, which arrives in McMurdo early the next calendar year. The chefs at McMurdo and Pole start using that food in the winter. At Palmer, food comes down in two yearly shipments, one in summer and one in the winter, because they don't have enough room to store a year's worth at once.

McMurdo is scheduled to get fresh food, known on the Ice as "freshies," once a week in the summer, some of which they pass on to the South Pole. But flight cancellations for weather can cause missed shipments, so several weeks without freshies isn't unusual. The only freshies in the winter come from the stations' greenhouses.

Annual food consumption (in kilograms)

Ingredient	McMurdo	Palmer
Beef	27,335	969
Poultry	17,362	642
Pork	8,804	266
Seafood	10,837	455
Legumes	5,513	144
Bread flour	54,485	455
Granulated sugar	3,409	273
Butter	4,257	327
Meatless Protein	909	86

South Pole numbers not available. *Source: Food services depart-*

Palmer gets all its supplies and people in by ship, which also delivers freshies about once a month. The station goes three or four months in the winter without getting restocked.

McMurdo and South Pole can get additional food from New Zealand if something runs out unexpectedly in the summer, Ayotte said. Palmer does the same with supplies from Chile.

Rush orders are the exception. Usually the chefs start planning ingredient changes long before they'll actually see them.

Beeler, who recently came to Pole after cooking at Palmer for five years, said she'd like to switch from ground beef to pre-made hamburger patties because it takes so much of the chef's time to make the burgers from scratch.

Even if she makes that decision now, she said, "those hamburgers aren't going to show up here until 2007."

Kitchen staff prepares food at Palmer Station, where the summer population stays around 40.

Photos by Kristan Hutchison / Special to *The Antarctic Sun*

Cooks work in the kitchen in the new station at the South Pole, where they feed a summer population of about 250.

Scientists seek better map of Antarctic plate

From page 1

a professor of geology at the California Institute of Technology. Steven Cande, of the Scripps Institution of Oceanography, is the principal investigator on the second cruise.

Geologists often use a tool called a plate circuit to help them understand the relationship between two adjacent plates. They make a model of a "circuit" by connecting one adjoining plate after another around the globe until they arrive back at their starting point. This helps prove whether their assumptions about the two original plates add up, in much the same way that putting together the complete puzzle proves that two individual pieces were correctly placed.

For example, geologists studying how the North American and Pacific plates interact along the San Andreas Fault will create a model that links the Pacific Plate to the Antarctic Plate to the African Plate and back to the North American Plate. If the geologists' theory matches up when they trace it through the plates and back to the original spot, then they know they're on to something.

Similarly, plate tectonics are used by scientists studying volcanic chains in places like Hawaii and Iceland that were created by "hotspots" deep inside the Earth. The circuits can verify their theories about the tectonic movements that carried older volcanoes away from the modern hotspot locations.

But in order to do this, scientists need to know for sure what the full puzzle looks like.

Stock and Cande's group has already solved one problem that was stumping geologists as they tried to reconstruct tectonic history. Antarctica currently consists of one plate, which is how scientists approached it when trying to put together models of the past. But there was a piece near Tasmania that wouldn't fit, Stock said.

> "They should match back together like two pieces in a puzzle."
>
> *— Geologist Joann Stock on how ancient tectonic plates should fit together*

The ocean south of Australia was formed when Australia and Antarctica split apart. Imagine you could take a knife and cut along the edge of Australia and of Antarctica as they were 30 million years ago, Stock said. "They should match back together like two pieces in a puzzle."

But they didn't. There was too much seafloor near Tasmania. "You couldn't get it to work right," she said.

Stock, Cande and fellow researchers discovered the reason why on a research cruise in 1997. Antarctica actually used to be two plates that pulled away from each other in the northern Ross Sea between 28 and 40 million years ago. They have since solidified into one plate, which is what confused geologists.

This discovery helped scientists understand how Antarctica fit together with Australia and New Zealand. It also aided geologists on other continents by providing more accurate information for their plate circuits.

The two upcoming cruises on the *Nathaniel B. Palmer* should expand on this discovery, Stock said. The first will depart McMurdo in February and take measurements of the ocean floor for three weeks as the ship heads to Chile. The second cruise in December 2006 will take about five weeks and travel from New Zealand to McMurdo.

The group will study the ocean floor east of Cape Adare and along the coast of Marie Byrd Land. The group chose the locations because they are geologically important and because the *Palmer* was going to pass over them on its regular "transit cruises," which the ship makes when it needs to switch ports, thus creating a cost-efficient way of doing the research.

The scientists on the first cruise will focus on taking bathymetric, or water-depth, surveys and magnetic measurements of volcanic rock on the ocean floor. Volcanoes are formed in the rift between two plates as they pull apart.

The volcanoes create rocks that are magnetized in sync with the Earth's magnetism at the time. Right now, that magnetic field is aligned to the north. But that hasn't always been the case. Every half million or

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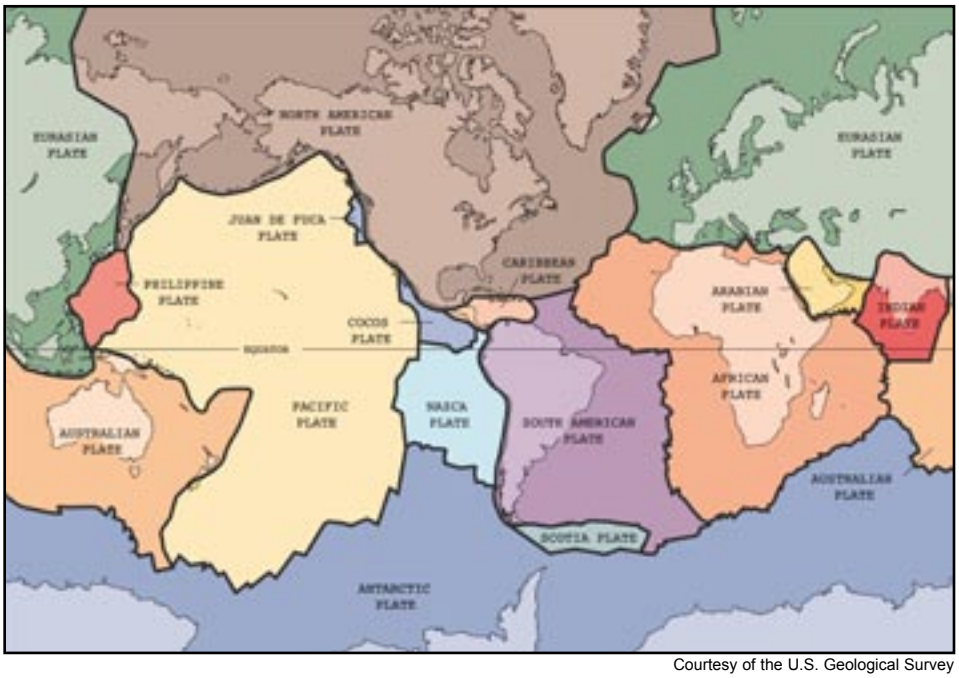

Courtesy of the U.S. Geological Survey

Courtesy of Joann Stock / Special to *The Antarctic Sun*

Above, the Earth's surface is made up of tectonic plates that have moved over the course of time. Joann Stock and Steven Cande's science group is studying the Antarctic plate. The plate provides crucial information to geologists because it touches so many of the other plates, and its edges are intact, which means it holds a good record of its historical movement.
Right, the science team deploys instruments off the back of the Nathaniel B. Palmer *on a research cruise in 2002.*

Antique tractor enthusiasts gather for movies

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born. He's quick to show pictures of the yellow tractor with his 9-year-old niece sitting happily on top, and often mentions the Antique Caterpillar Machinery Owner's Club, of which he's a long-time member.

Petraitis also collects old tractor movies, mostly promotional films from the Caterpillar company. He brought about a dozen video tapes with him to McMurdo. A friend asked to borrow one, but didn't have a VCR in his room. They came up with the idea to show movies in a lounge and make a club out of it, Petraitis said.

Petraitis likes that he's able to give something back to the community by creating a social activity for tractor fans. Plus, he likes to joke, if he can't get a date he might as well watch old tractor movies.

The first meeting drew about 40 people, including several members of the South Pole Traverse team, whose lifeblood are the tractors pulling the equipment and supplies across the continent. That night they watched the hands-down group favorite, "The Great Tractor Race," a 1930s black and white film of a very slow race up and down gullies, over trees and through barns as needed.

The second meeting drew a crowd about half the size, nearly all of them men, who watched two hours of movies about the tractors that built fire access roads in the American West, and constructed the AlCan Highway from Alaska to Canada, which was used to transport military personnel and supplies during World War II.

The group occasionally shouted and groaned as the drivers bounced around in their cabs or perched precariously on the side of a steep slope. Every now and then someone identified a certain machine model, or threw out a rhetorical question about whether anyone would want to use those old machines to build a runway or maintain a road now.

Dave Tuepker, a mechanic in the fuels department, went to both meetings. He has 32 antique tractors dating from 1928 spread out among different friends' and relatives' houses for storage. He's well versed in tractor history and is happy to give a lesson in how the design and technology evolved. He pulls out old pictures, advertising posters and literature about the machines as he talks.

He's got four big tractors — three of them "high crops," with a higher than normal cab so the tractor can move over plants growing well off the ground — eight smaller riding garden tractors, and 20 walk-behind, two-wheeled garden tractors.

Tuepker's interest in tractors took root while growing up on a poor, "bottom land" farm along the Missouri River.

"That's all we could afford," he said of the old tractors. Still, they were an improvement over the mules that his grandfather farmed with.

Tuepker is drawn to odd and unusual antiques. His favorite is the steel-wheeled, 1928 Shaw walk-behind tractor he bought recently. The seller wanted to get rid of his whole collection, so Tuepker agreed to buy all 10 of the man's tractors in order to get the one he really had his eye on.

Poster courtesy of Dave Tuepker / Special to *The Antarctic Sun*

Courtesy of Steve Petraitis / Special to *The Antarctic Sun*

Above, this old advertising poster shows the type of walk-behind tractor that Dave Tuepker collects. Left, Steve Petraitis rides his "pride and joy" Caterpillar D-2 tractor at home. He started the McMurdo Station Antique Tractor Club.

He said people still look for the old walk-behind tractors to use in their gardens.

"There's nothing out there that can touch them," he said.

Fleet Operations Supervisor Gerald Crist deals with the big tractors. He oversees the station's heavy equipment, including the three stretch D-8s from the 1950s that are still used today. The tractors, called Pam, MaryAnn and Coleen, retain the women's names they got in their Navy days. They were specially designed by Caterpillar for polar work. Their extra-long tracks reduce the ground pressure, making them ideal for traveling over snow and ice because they're less likely to break through.

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Geologists across globe use Antarctic plate data

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million years the field switches direction, but the rocks retain the magnetism of the time they were born. By measuring which way the rocks are magnetized on the ocean floor — a technology that was discovered during World War II while Americans were looking for German submarines — scientists can tell when the rocks were created.

On the second cruise, the ship will move more slowly, which allows the scientists to take seismic readings. This will help them understand the sedimentary layers and fault patterns in the ancient seafloor that was created when the two Antarctic plates split. There are still many questions about how that ocean floor spreading affected the Antarctic continent, Stock said.

Earth sciences professor Tanya Atwater uses information from Stock and Cande's work in her research at the University of California at Santa Barbara. Atwater focuses on the tectonic plates of the western United States, particularly the San Andreas Fault.

"I use the circuit solution all the time to try to work out all sorts of things about western North America," she said. "It's completely hung on Antarctica. … That's the only stepping stone you can use."

The Antarctic plate is important not only because it's the link between the Atlantic and Pacific regions, but also because of the composition of the plate itself, she said. Antarctica's plate is bordered all the way around by spreading centers, which are places where two plates have moved apart, as opposed to areas of subduction, where two plates smashed together and one has been pushed under the other.

Courtesy of Joann Stock / Special to *The Antarctic Sun*

Joann Stock and Steven Cande work in the lab onboard the Nathaniel B. Palmer *during a cruise in 2002. They will continue their tectonic research on two upcoming cruises.*

"Subduction destroys the evidence," Atwater said. Spreading centers hold a record of everything that's happened there, and are best for making reconstructions.

"It's absolutely vital work," she said of Stock and Cande's project.

NSF-funded work in this project: Joann Stock, California Institute of Technology, and Steve Cande, Scripps Institution of Oceanography, www.gps.caltech.edu/~jstock/

Old D-8s have fans

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Yet sometimes they do. Two Navy men died on D-8s in 1956 at McMurdo and Little America V. Other tractors have fallen through, including Linda, which went into a crevasse on Thanksgiving eve in 1991. No one was hurt, but Linda was lost.

"It was our flagship," Crist said. "It was our sweetheart."

Crist said he enjoys watching the old movies, particularly to see the contrast between our safety-conscious culture and the more reckless work styles of the past.

"It is fascinating to see how they did it and how the machines progressed," he said. "It's a hoot."

Crist is quick to point out that he's not a true tractor enthusiast like Petraitis and Tuepker, who have made antique tractors a hobby. Mechanics, who explore the inner workings of the machines, are more likely to become enthusiasts than the men who drive the tractors during long work days.

"We've been beat up enough by that equipment," he said.

Continental Drift

What's the dumbest question you've been asked about Antarctica?

"Are there a lot of polar bears down there? This from an environmental studies major."

Bess Koffman, Palmer lab technician from Bar Harbor, Maine, first season

"So how many seasons have you worked in Alaska?"

Jon Olander, South Pole utility tech from Denver, Colo., fourth season

"Will you see any polar bears? Most people don't even know where to start asking questions about Antarctica."

Brandon Andow, McMurdo utility mechanic helper from Denver, Co., first season

Profile *A new Ice adventure begins*

By Peter Rejcek
Sun staff

Just days from arriving at the South Pole in 2000, Heidi Hausman discouragingly turned to her expedition leader and chided him about not doing a better job of picking people who were physically up to the challenge of a ski trip across Antarctica.

At the time, Hausman was hauling an 80-kilogram sled laden with supplies across bumpy sastrugi, irregular formations on the snow surface carved by the wind. Over the last nine months, she and seven others had biked and skied 35,000 kilometers from the North Pole toward the South Pole to heighten environmental awareness. Hausman said she felt that she was always the expedition's slowest member, dragging the team down like a parking brake still engaged.

But then a simple epiphany: Leader Martyn Williams pointed out to her that the expedition's strongest members could no longer shoulder their loads because of sickness or injuries. Hausman was hauling as much as 50 percent more on the sled than when the Antarctic leg of the trek had started.

"It's a bummer feeling like you're the slowest person," recalled Hausman, who is working this season as a meteorological technician at the Lake Hoare field camp in the McMurdo Dry Valleys. "I was beating myself up for being the slowest bike rider … [but] it doesn't matter how fast you do something, but that you do it."

The lessons and experiences of the Pole To Pole 2000 expedition bolstered her self-confidence. It also fostered an urge to return to the continent in any way possible after graduating from Brown University in 2002 with a degree in environmental studies. Last year, she worked at McMurdo Station as a general assistant and got an assignment to work in a field camp for a month. She turned that opportunity into the Lake Hoare position this season.

"It's a way to get back," said the 25-year-old adventurer. "I would love to be in an expedition again. That's where my heart is."

In lieu of the kind of expedition she joined five years ago (becoming one of the youngest women to ski to the South Pole in the process), Hausman said she's excited to work in a field camp in the Dry Valleys, mixing with the various scientists who pass through.

"It's a huge privilege considering how many people apply for field jobs," she said of her current position. "It's fascinating to be close to the science … [In some jobs,] it's hard every day to remember you're working for the science."

Heidi Hausman hauls chunks of ice from Lake Hoare back to the field camp, where it will be melted for water. Back in 2000, before joining the U.S. Antarctic Program, Hausman became one of the youngest women to ski to the South Pole.

Rae Spain / Special to *The Antarctic Sun*

The work at Lake Hoare is never the same from one day to the next, according to Rae Spain, the camp supervisor. One day the support personnel may work with science groups, showing them how to establish campsites. Another day is all about helicopter operations. A "day off" may be spent catching up on camp maintenance.

Spain said the job prerequisites are excellent communication skills and being comfortable working in close quarters. "You have to be really good with people … I thought [Heidi] could handle the job," she said.

These days Hausman calls Falls Church, Va. home. In reality, she's one of those children of the global village. Born in Nairobi, Kenya, she spent much of her childhood in Africa, where her parents worked in the U.S. Foreign Service. She went to middle school in Niger and high school in Rabat, Morocco.

"I loved it … We traveled all over the place," she said of her international upbringing. "I'm going to raise my kids overseas as well … I'm into doing the international thing that my mom and dad did."

With the world literally serving as her classroom, it's no surprise that Hausman chose to involve herself with an expedition like Pole to Pole 2000 and align herself with its values. The project was the brainchild of Martyn Williams, a Canadian who is the first person ever to lead expeditions to both poles as well as Mount Everest. The idea behind the trip was to find seven young people from different countries willing to spread the message of sustainable living across the planet.

"The goal of it was to bring awareness about the plight of the world," Hausman explained. "It had a [second] message: If you have a passion and a goal, you can accomplish anything."

A strong proponent of environmental conservation, Hausman plans to travel to Bolivia next year to participate in a forest certification program. The program encourages countries to practice sustainable forestry.

"Small things are going to make a big difference if we all start doing them," Hausman said of improving the planet's environment.

That's what she felt strongly about when she joined Williams' group. So despite a shoestring budget, and subsisting largely on Ramen noodles, beans and rice for months, the expedition succeeded in carrying its message from the top to the bottom of the world by making its way across North, Central and South America. Along the way, the team planted trees, talked to schoolchildren and picked up "tons of trash."

The expedition persevered in spite of suffocating heat, numbing cold and even hungry polar bears.

"It made me realize that I could do a lot of these things for myself," Hausman said. "It was very empowering to know that I knew how to ski, how to get around, how to set up my tent, how to boil snow — that I could survive 30 days hauling everything, not needing anything else, was very cool.

"I can pull my own weight."