The Antarctic Sun

Published during the austral summer at McMurdo Station, Antarctica, for the United States Antarctic Program

November 16, 2003

# Mapping the sky with neutrinos

## *South Pole telescope proves value of concept*

By Brien Barnett
*Sun staff*

Strings of highly sensitive light detectors buried 2 km deep in the ice at the South Pole may have yielded the first sky map of neutrinos.

Neutrinos are ghostlike subatomic particles with nearly no mass that may hold the key to unlocking more of the universe's secrets.

Scientists analyzing data collected in 2000 from the AMANDA II subsurface telescope at Amundsen-Scott South Pole Station unveiled the map at a meeting of the International Astronomical Union in July. They said they had made the first sky map of high-energy neutrinos, which are emitted by such things as neutron stars and colliding black holes. The map was created from the reconstructed paths of neutrinos detected by the telescope. It is one of the first steps in learning more about distant regions of the universe.

"Neutrinos are the best vehicle we've got for looking very, very far out into space, which is the same thing as looking very far back in time," Bob Morse, professor of physics at the University of Wisconsin, Madison, said. Morse oversees the AMANDA project.

AMANDA, an acronym for Antarctic Muon and Neutrino Detector Array, is a complex telescope that actually "looks" through the Earth into the northern hemi-

**See Amanda on page 11**

Photo by Kristan Hutchison/The Antarctic Sun

*Welder Bob Jirschele works on an old tank at Palmer Station with Arthur Harbor and the glacier in the background.*

# Building a better base for science

By Kris Kuenning
and Kristan Hutchison
*Sun staff*

Almost 50 years after the heroic beginnings of U.S. Antarctic research, a lot has changed. From a few intrepid explorers, there are now more than 3,400 people coming to the Ice each year.

Keeping up with science is a matter of constant evolution for the stations that support Antarctic research.

Compared to the harsh existence of the early explorers, most people working in Antarctica today live in relative luxury at one of the three U.S. stations. This improved standard of living is the result of continuous upgrades and construction, which are now done with an eye toward minimizing the overall footprint on the continent.

The largest current construction project for the U.S. Antarctic Program is the elevated building at Amundsen-Scott South Pole Station. After the first station succumbed to snowdrift, a dome was erected in 1975. By 1989, snowdrift and settling were enough of a concern that plans began for yet another building. The existing facility was also becoming overcrowded and reaching the end of its design life, with

**See Building on page 9**

**INSIDE**

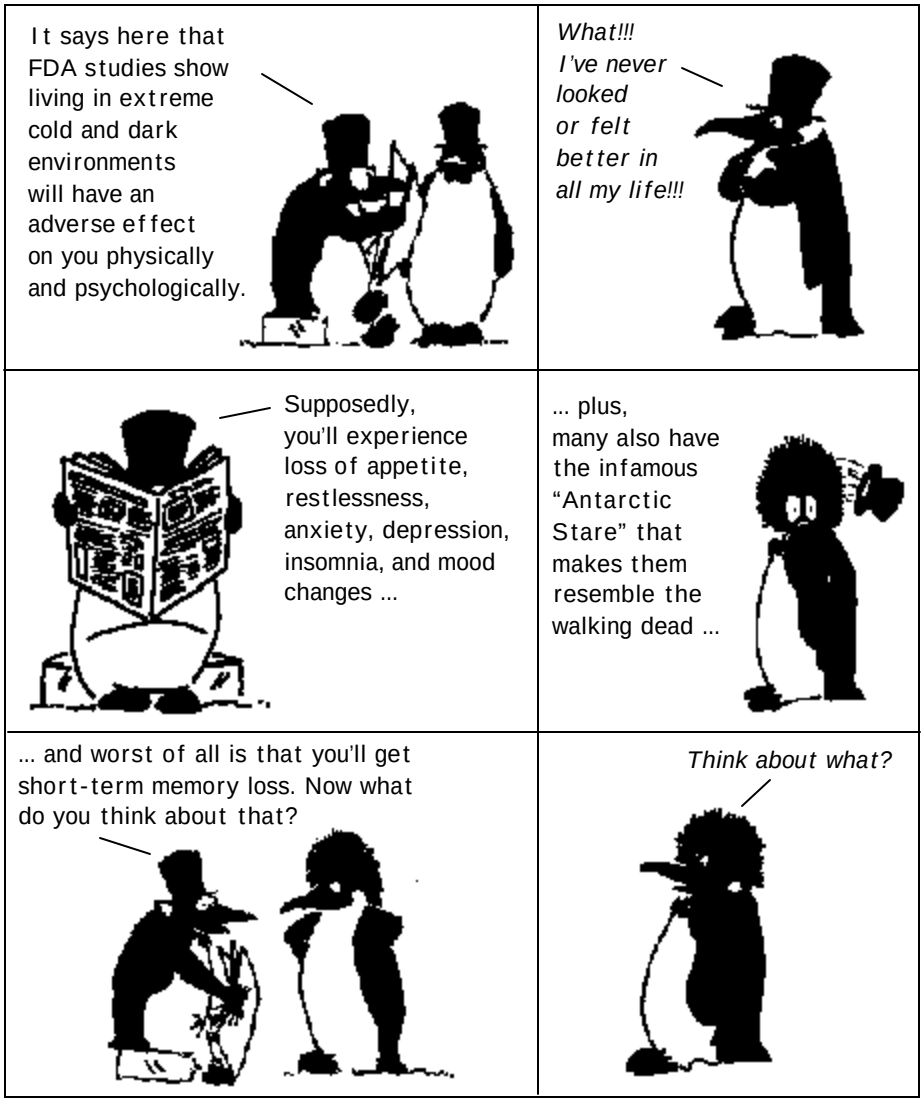


**Quote of the Week**

"All I know is if you pull up on the stick, the houses get smaller. If you push down, the houses get bigger."

*- A helicopter pilot explaining how to fly*

Ross Island Chronicles By Chico




***The Antarctic Sun*** is funded by the National Science Foundation as part of the United States Antarctic Program (OPP-000373). Its primary audience is U.S. Antarctic Program participants, their families, and their friends. NSF reviews and approves material before publication, but opinions and conclusions expressed in the *Sun* are not necessarily those of the Foundation.

**Use:** Reproduction and distribution are encouraged with acknowledgment of source and author.

**Senior Editor:** Kristan Hutchison
**Editors:** Brien Barnett
Kris Kuenning
**Copy Editor:** Melanie Conner
Geoff Jolley
Wendy Kober
JD Menezes
**Publisher:** Valerie Carroll, Communications manager, RPSC

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

**Web address:** www.polar.org/antsun

## Check it out online


Melanie Connor / Antarctic Sun

*An Adelie penguin defends its nest from a skua.*

**Find this image and many more at the Antarctic Photo Library. Click on the link off the *Sun*'s homepage.**

# Cold, hard facts

## People on the Ice

*Here's the lowdown on this year's RPSC crew, including contract and full-time personnel:*

**35** are sailing the high seas
**675** are melting at Mactown
**196** will see the South Pole
**20** are chillin' at Palmer

*For all ships, stations:*

"Two guys for every girl"
(apologies to the Beach Boys)

Men: **615** (67 percent)
Women: **309** (33 percent)
Youngest: **18**
Oldest: **68**
Average age: **37**

White: **844**
Black: **7**
Hispanic: **23**
Asian or Islander: **10**
American Indian: **9**
Other/not indicated: **33**

*Top 10 home states:*

*"The West is the best"*
*(um, )*

Colorado: **197**
Alaska: **69**
Washington**: 64**
California **52**
Montana**: 39**
Idaho: **36**
Minnesota: **35**
Oregon: **34**
Wyoming: **29**
Texas: **20**

There are people from **49 states** and **three foreign countries**.

Only **Delaware** is not represented among the RPSC crowd, though there are grantees who call the state home.

*Other places some call home:*
New Zealand: **2**
Ontario, Canada: **1**
Virgin Islands: **1**

Source: Raytheon Polar Services Company, Human Resources

# Probes detect cold-water 'avalanche'

By Kristan Hutchison
*Sun staff*

Oceanographers were stunned when the expected slow flow of cold water from the Antarctic continental shelf became more like a torrent one evening last March.

Though the Antarctic slope study had barely begun, the results have already changed the way oceanographers think of the cold, dense water that drops from the Antarctic margins and drives ocean circulation.

"Every time you go out and make measurements in the real ocean, you make discoveries," said oceanographer Arnold Gordon from Lamont-Doherty Earth Observatory of Columbia University. "We've been surprised by the observations, so we'll be challenged to come up with an explanation."

The observations occurred during a cruise aboard the *Nathaniel B. Palmer* in the western Ross Sea from February to April. During the cruise, the researchers set out a dozen instruments attached to moorings anchored to the seafloor from 270 meters to 1,780 meters deep. The instruments record the ocean currents, temperature and salinity of the water for one year. The moorings are clustered in a 50-kilometer area southeast of Cape Adare, where the continental slope makes an abrupt turn to the north.

Thick ice covered some of the locations where Gordon needed to deploy the instruments, so two of the monitors had to be placed in the wrong locations. Three weeks later the *Nathaniel B. Palmer* returned to move the misplaced instruments, giving Gordon a sneak preview of the data.

He'd expected to see the cold water oozing down a 1-degree slope. Instead he found it rushing down at a 10-degree to 30-degree angle, moving with a speed of 1.8 kph. Most dramatically, late in the day March 12, an outburst of dense shelf water dropped at a rate of about 5.5 kph. The water temperature at the sea floor was –1.6 C with a salinity of 34.78, significantly colder, saltier and therefore denser than the average. For almost seven hours the cold current descended at a 90 degree slope from 500 meters to almost 1,400 meters deep.

"It must have plummeted like a rock," Gordon said. "You can think of it almost like an avalanche."

The Ross and Weddell seas both produce Antarctic bottom water, as do a few locations along the coastline of East Antarctica southwest of Australia.

Cold air blowing off the continent chills the coastal water, freezing some of it into ice and leaving a saltier, -1.9 C water below. This dense water moves to the edge of the continental shelf and sinks to the deep sea floor, spreading north out of the Southern Ocean.

The movement of the cold bottom water sets in motion global scale circulation in the ocean, as the fresh, cold bottom water lifts up older water that has had time to be warmed by the layers above. The warmer water moves back to the Southern ocean, where the cycle continues.

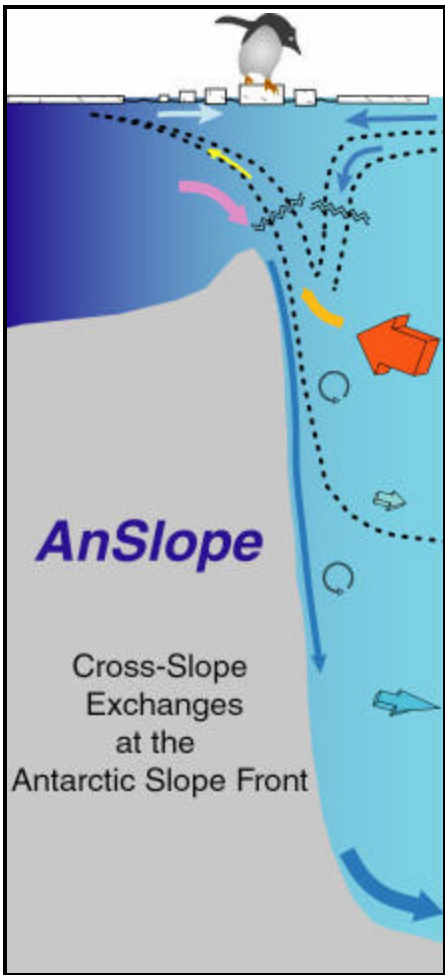



Image courtesy Lamont-Doherty Earth Observatory at Columbia University

*The graphic demonstrates how cold water cascades off the continental slope and dives beneath warmer water, creating a circulating effect.*

The cycle prompted by Antarctic bottom water helps drive deep ocean currents, circulating nutrients from the deep sea to the top layers of the Southern ocean, where marine plants and animals use them. The circulation also draws carbon dioxide into the ocean. The ocean has absorbed as much as half of the CO2 released through the burning of fossil fuels. Currently the ocean is very cold in a geological sense because of the influx of Antarctic bottom water. But nobody knows yet what controls the production of the cold water or what exactly turns the tap on higher or lower.

"If for some reason you turned off your cold water source, like stopping the Antarctic bottom water source, then all of a sudden 80 percent of the deep water will be isolated from the climate system," Gordon said.

The deep ocean circulation would slow, potentially altering the ocean's ability to absorb carbon dioxide and reducing the nutrients reaching the surface. Researchers want to learn what processes control the formation of bottom water in order to predict how the water might change with global warming.

"What we were trying to do at this point is get the climate models correct," Gordon said. "Just so we can predict how our activities will alter the climate."

The two flow patterns detected by the cruise have different implications for the ocean. When the cold water drops more slowly, it has time to mix with the layers it is passing, warming slightly and changing its nutrient and chemical makeup. The fast-dropping cold water doesn't have time to mix or change.

"By this water sinking so rapidly to the sea floor, it gets into the deep ocean without much alteration," Gordon said. "The outbursts, such as measured on 12 March, allow more concentrated dense waters to get into the deep ocean."

It's possible the March 12 event was an isolated instance, but Gordon expects to find it happens every few weeks.

"We don't really know what caused the event observed on 12 March. We think it had something to do with the tides," Gordon said.

If it does, that will change current climate models, which don't take tide into account, yet. Gordon said tides will probably need to be added into the predictive models. He will present the early results in January at the ocean sciences meeting of the American Geophysical Union.

"We're hoping that what we learn about the physics is transferable to other areas in the Antarctic," Gordon said.

A follow-up cruise is planned for this February, with Martin Visbeck as chief scientist to collect the current meters and replace six of them. Another cruise in October 2004 will look at the late winter conditions, with Stan Jacobs as chief scientist.

Perspectives

# Lessons learned on the Ice useful in business

By Ann Peoples

In 1981, I drove a shuttlebus between McMurdo and Willy Field. If one of my passengers had predicted that 20 years later I'd be in business school earning an MBA and telling stories about the Antarctic Program, I'd have assumed someone slipped through the psych exam. After all, what does the U.S. Antarctic Program have in common with business school?

As it turns out, quite a bit.

It was while working on one of the Antarctic Program contract re-bid teams that I became interested in the relationship between traditional profit and loss businesses and organizations like the U.S. Antarctic Program. That interest planted the business school seed. Once the re-bid was over, I entered business school at University of California, Irvine.

The connections between the Antarctic program and business surfaced in my first class – Organizational Behavior. This class highlighted the complexity of organizations given their unique combination of four things: Structure, human resources, politics, and culture. Can you imagine the fun I had with this topic? Even in a world of unique businesses, the Antarctic Program stood out, especially in culture and human resources. Retail businesses were similar to the Antarctic Program in the way their personnel doubled on a seasonal basis, but they didn't have the cross-section of interests and skills we see in the Antarctic Program or the work location's environmental rigors. As for cultural symbols – nobody can beat "The Pole" and all it stands for.

Commonalities between the Antarctic Program and the commercial business world emerged in all my classes. Yes, we did the number crunching that is expected of an MBA: Financial management, accounting, and statistics. But the underlying theme, even in these quantitative classes, was using the information to make better decisions about your course of action, and to listen, in a numeric language, to the feedback from customers about their priorities and your perforance.

The Antarctic Program provided a goldmine of practical examples for my classes in decision modeling and negotiation.

Photo courtesy Ann Peoples

*Ann Peoples takes a break in front of Mount Erebus during her time on the Ice.*

Multiple stakeholders, large capital investment and huge fixed costs, tight timelines, and limited second-chance opportunities make the Antarctic Program's resource decisions and allocations more difficult than many commercial outfits.

Extrapolating the Antarctic experience into business school discussions hit home in a personal way in my last class – Leadership Practices. The course material mentioned three Old Antarctic Explorers by name. Not surprisingly, Shackleton and Scott were there. The third was Rob Hall. Rob was a Kiwi survival school instructor in the mid-1980s when I was the Berg Field Center Manager and survival school was a joint U.S.-New Zealand program run out of the BFC. He was also one of several mountaineers who died on Mount Everest in a May 1996 storm.

The leadership class examined the qualities of successful and failed leaders and the difference between crisis and everyday situations in leadership emergence. How the class used the Antarctic explorers as examples was surprising. We discussed the differences between "leaders" and "heroes" and whether the two were mutually exclusive. We debated whether leaders could emerge without adversity. We studied each explorer and his situation. Was Scott a hero or a leader? How about Rob Hall? Did Shackleton demonstrate qualities of both? How do these people relate to modern business? The conclusion wasn't surprising - whether you're on the Ice or in a business office the characteristics underlying successful leadership are the same. Leadership is about vision and values. It's about successfully managing conflict and dealing with adversity. Leadership is setting the example. It's the need for endurance and innovation in order to survive and thrive.

What is it about Antarctica and its people that runs parallel to the business world? It's the shared individual drive. Business starts with entrepreneurs – independent types with a willingness to experiment and a tolerance for risk. Antarctica beckons to a similar type person. Whether it's creating a new service, asking a new research question, or traveling and working in unusual areas, it's about the enthusiasm to try something new – and the drive to be successful at it.

I learned a lot in business school but one of the most exciting things was looking at my time in the Antarctic Program in a different light. In this, T.S. Eliot springs to mind:

*We shall never cease from exploration*
*And the end of all our exploring*
*Will be to arrive where we started*
*And know the place for the first time.*

---

*After 15 years in the Antarctic Program, Ann Peoples left in 1995. Along with several other Antarctic veterans, she went to Johnston Atoll where she worked as the Operations Director. She eventually left the Atoll to work on one of the Antarctic Program contract rebid teams. In 1999 USGS named a series of islands near Palmer Station "Peoples Rocks" in her honor, recognizing a career that started as a shuttle bus driver and included being the first woman BFC Manager and the first woman Station Manager. A year later, she entered business school at University of California. In June 2003 she received her Masters Degree in Business Administration (MBA), graduating first in her class. Peoples attributes her class standing to the unique perspective she brought into the classroom. She says she still feels the deployment itch every August.*

# around the continent

## SOUTH POLE

### Bagel holes at the Pole

By Peter Rejcek
*South Pole Correspondent*

South Pole … a seemingly endless 360-degree expanse of ice and snow that, with a quick trick of the eye, seems to undulate like a restless ocean. At this final frontier of relative hardship, one wouldn't think you could find a good bagel.

Think again.

Thanks to Jack Giacalone, along with a steady stream of volunteers and the help of the kitchen staff, Polies need not miss out on their regular diet of a bagel — cream cheese optional.

For the third summer in a row, Giacalone, a surveyor with Raytheon, is taking his passion for baking into the kitchen, mass producing bagels on a weekly basis. He and a couple of volunteers created the first big batch of the season last Sunday. Giacalone is wintering for his first time, meaning fresh bagels year-round.

"I'm a natural in the kitchen," Giacalone said, explaining why he devotes his time to providing the popular breakfast staple to his fellow Polies. "It's relaxing."

The work usually takes place on Sunday night. Giacalone prepares the dough beforehand, using a commercial process he learned while working as a baker and that he later applied to his own bakery and espresso stand in Seattle in the 1990s. By the numbers, it takes about 22 kg of flour, 11 liters of water and 680 grams of sugar to make 30 kg of dough. That makes 268 bagels.

"They're the best bagels I've ever had," said Polie Andrea Dixon, who turned up Sunday to help mold the dough into 113-gram, doughnut-shaped bagels.

"There are a lot of people who want to help," Giacalone noted.

By the time the volunteers arrive, the dough is ready. Giacalone sends 4 kg chunks of dough through a slicer — a heavy appliance with a slot machine-arm that cuts the dough into bagel-sized pieces.

After that it's just a matter of taking the fist-sized dough and flattening it with the palm of the hand, folding this pancake three times into a fat sausage and then rolling it with both palms until it's about the length of two hands from thumb to pinky. The long roll is then wrapped around the hand like brass knuckles, with the two end pieces squeezed together, quickly rolled and placed on a cookie sheet. The bagels are then frozen, later to be thawed, boiled and baked by the kitchen staff.

"It's really very simple," Giacalone said.

This batch included both plain bagels and pesto bagels, using fresh basil from the station's greenhouse, which Giacalone also helps maintain with volunteer help.

Photo by Peter Rejcek/Special to The Antarctic Sun

*Jack Giacalone rolls out a bagel in the South Pole kitchen.*

Giacalone's bagels are just one of the touches that make coming to Pole for the first or tenth time special. Also back this year is bingo night on Saturdays, with James Brown calling the numbers. Saturday's first installment found the galley packed, with residents vying for a variety of prizes, from the latest souvenirs to arrive at the station store to bars of chocolate.

The weekly Sunday science lecture is also back this year. Last Sunday's lecture was presented by Robert Morse on neutrino particle physics. As always, the lecture drew a standing-room-only crowd to the new galley.

## SHIPS

### Nathaniel B. Palmer

Compiled from reports
by Don Michaelson

After 4 days at a standstill with engine trouble, the Nathaniel B. Palmer turned around to return to Lyttleton, where the engines can be fixed. Along the way, it stopped to do as much science as possible. Able to cruise up to 6 knots through thin ice, the *Palmer* was not setting any speed records, but was making progress. It reached the ice edge by noon Nov. 9 and spent the afternoon with the free-falling conductivity, temperature and depth instrument, understanding the system and getting the weight right for a straight down free fall. The ship floated around in place till the early morning hours, then the scientists collected oodles of water just before sunrise. The day was spent doing more sampling. When the weather cleared, the scientists took a Zodiac out to harvest some brown ice. After three days, the ship continued to Lyttleton, New Zealand with arrival expected Nov. 20,

### Laurence M. Gould

Compiled from reports by Steve Ager

The *Laurence M. Gould* left Punta Arenas Nov. 7. The ship was hammered entering the Drake Passage, with 4 m to 8 m seas and 96 kph winds gusting from the southwest. As a result, the crew started taking water measurements a little farther out than usual. Once the *Gould* got out of the wind tunnel between Tierra Del Fuego and Isla Estados, things calmed enough to turn the ship into the weather to reload the launcher. The next day conditions in the Drake Passage calmed down a bit.

The *Gould* arrived at Cape Shireff to set up a camp there on Nov. 11. After an early breakfast, the crew began boating operations at 6:00 a.m. With two Zodiacs running for 5 hours and excellent weather conditions, the crew had all equipment and personnel ashore by 10:30 a.m. The *Gould* headed south for Croker Passage to carry

**See Palmer on page 6**

## the week in weather

**McMurdo Station**
High: 34 F/ 1 C Low: 9 F/ -13 C
Wind: 31 mph/ 50 kph
Windchill: -31 F/ -35 C

**Palmer Station**
High: 37 F/ 3 C Low: 21 F/ -6 C
Wind: 60 mph/ 97 kph
Windchill: 5 F/ -15 C

**South Pole Station**
High: -23 F/ -30 C Low: -47 F/ -44 C
Wind: 31 mph/ 50 kph

# Palmer From page 5

out some night fishing on behalf of researcher Jeannette Yen, before continuing to Gerlache Strait and Palmer Station.

## PALMER

### Roasting pigs

By Kristan Hutchison
*Sun staff*

After a week busy with science and logistics work, Palmer Station residents gathered on the pier Saturday evening to barbeque hamburgers, garden burgers and bratwurst. Their grill is a mark of Antarctic ingenuity, created from a hinged barrel and scrap metal, with the figure of a pig on top.

The homemade pig roaster was created last year, after the cook ordered a pig didn't have a place to cook it.

"It's a tradition. Antarcticans always had pig roasts," said Palmer Station cook Wendy Beeler. "If you go through the photo albums here you'll see lots of pigs."

In keeping with tradition, Beeler ordered a pig. When the 40 kg carcass arrived on the *Laurence M. Gould* in January she realized it wouldn't fit in the oven.

"I never knew how we were going to roast it," Beeler said. "The roasting in the ground got ruled out because of environmental issues."

Beeler found a photo of a furnace turned into a pig roaster online. That inspired welder Bob Jirschele, who worked on Sunday and before and after work to turn scrap metal into a roaster. Jirschele had some experience with roasters, since he has a larger roaster at home made by his stepfather.

"They had an image and they just went for it," Beeler said.

By February the roaster was ready and Palmer celebrated the return of the Long Term Ecological Research cruise with a luau.

"It's no question you're having a party when there's a pig around," Beeler said.

Since then, the roaster has also been used for hot dog, duck, and steak. Beeler ordered another pig recently, but ended up with 30 kg of ham hocks instead.

"I think we need to work on our Spanish translations," she wrote.

### Importance of Krill

By Kerry Kells
*Palmer correspondent*

Macrozooplankton — large animal plankton species mostly at the mercy of currents — otherwise known as krill, live here in the Southern Ocean. Studies of krill are an important aspect of the Long Term Ecological Research project. They are the "prey" component of LTER, prey to the penguins, fish, whales and seals that live in our area. For LTER, the physical processes that help or hurt the success of krill are an important component related to the interannual differences in the extent of pack ice. What drives the success of krill, what factors relate to a healthy school and how is krill success linked to phytoplankton success and to penguin success?

Krill are sought, observed and collected by the acoustic/trawling Zodiac as well as by scuba diving. Our researchers on station, with Robin Ross and Langdon Quetin as the principal investigators, study the interactions among krill, its food sources and its predators. While the adults form schools (large cohesive groups that swim together), the young larval krill tend to swarm (smaller, looser groups that are more chaotic). Food sources include the phytoplankton (free-flowing plant life) that develop on the ocean ice, noticeable by the yellowish tinge they create on the ice. Larval krill scrape the ice to feed directly on these microbes. Looking through a microscope at juvenile krill, one can see a greenish section of their almost transparent bodies. This is the phytoplankton in their stomach and digestive gland. Krill are a source of food for penguins, different types of fish, whales and even leopard seals. While penguins will eat fish as well, in our area they prefer krill.

In the laboratory, collected krill are tested on their physiological condition (how healthy they are, how fat or skinny), metabolic rates and growth production. A couple hundred krill are required for several tests to be run. The krill have a hard skin, almost like a shell, called the exoskeleton. Like lobster, they shed this skin as they expand to the next larger size. Scientists then measure this larger size to the smaller, discarded skin, to determine growth rate. They focus on the spine section of the tail and the main part of the animal's body. Carbon, hydrogen and nitrogen ratios are measured to determine how fit the krill are. Back in the States, analysis of protein and lipid components (fat content) reveal the physiological or chemical conditions of krill.

Sea ice affects everything that is going on in the Southern Ocean. Without the ice, the phytoplankton that larval krill depend on is unavailable as a food source. Most important to the larvae is the end of the winter ice cover. Adult krill are not as dependent on ice as larval krill and are better able to make it through a long winter of low light, low phytoplankton and heavy ice. This past winter was a low ice season in the Peninsula region. In the middle of the summer season, additional surveys focus on schooling behavior, swimming behavior and field ingestion protocol used at sea. Krill are then another piece of the Southern Ocean ecology puzzle and an important factor on the food chain.

## Continental Drift

**What part of your work is harder because you're in Antarctica?**

**"Here at Palmer, the scenery keeps getting in the way."**
Mike Jayred
*Palmer station waste management specialist from Livingston, Montana, 5 seasons*

**"It takes an hour to go to the bathroom."**
Lisa Aiken
*South Pole materials person from St Mary, Mont., third season*

**"It's cold. I'll tell you what makes it easier. People can't call me."**
David Saltzberg
*ANITA-lite researcher from Los Angeles, first season*

Photo by Kris Kuenning/The Antarctic Sun

*Polar T3 researcher Kathleen Reedy checks the bloodpressure of study volunteer Mike Blachut, who will spend both summer and winter at McMurdo Station.*

# Shedding light on winter blues

By Kris Kuenning
*Sun Staff*

A vacant stare. A perplexing mid-sentence pause. A general vagueness or malaise.These are some symptoms of a problem that used to be known as "winter-over syndrome." Now believed to be linked to thyroid hormones, the disorder is more commonly referred to as polar T3 syndrome.

Psychologist Larry Palinkas and a team of others, including physiologist Kathleen Reedy, have been studying the effects of extreme cold on the body for more than a decade.

The researchers have discovered that people living in Antarctica commonly lose one degree in body temperature. They also consume 40 percent more calories and use 35 percent more energy when resting or exercising when compared to their routines in temperate environments.

Research has also documented changes in the thyroid system, which is responsible for regulating the body's metabolism. The T3 hormone and related hormones are decreased in the central nervous system and increased in the muscle tissue. While this extra thyroid hormone in the muscle helps create friction to keep the body warm, the deficit in the central nervous system makes people forgetful, sluggish and even depressed.

Palinkas's team wanted to know more about what causes polar T3 syndrome and how it can be treated. Last year, 40 summer and 40 winter participants from McMurdo were given either a placebo or one of two treatments. Some people took a daily tablet of thyroxin, a thyroid hormone, while others ate applesauce mixed with powdered tyrosine, an amino acid dietary supplement.

"Our preliminary analyses indicated that the two interventions performed about the same, with the thyroid supplements performing slightly better in reducing symptoms of fatigue, depression, and anger, and both doing much better when compared to the placebos some people were taking," Palinkas said.

So far, only the early summer data have been collected and processed but these early results have helped Palinkas refocus the study this year.

"Although we are awaiting the remainder of the data collected during the summer and all of the data collected during the winter to complete our analysis, we felt that we had enough information to select the thyroid supplements to compare with light therapy for this coming year," he said.

Now that they understand how thyroid changes occur, they want to know more about why they occur. Is it simply the cold? Or are the long, dark winters also to blame? Understanding the syndrome better will make it easier to treat and prevent, Kathleen Reedy said.

Reedy and Marc Shepanek are currently recruiting 20 volunteers from

**See T3 on page 8**

## T3 From page 7

McMurdo and 20 volunteers from South Pole to participate in the study this year. They especially want winter participants because of a new component in the study, light therapy. Study participants will take thyroxin or a placebo and sit beside a light box for 30 minutes each morning, five days a week. Throughout the year, they will be asked to record information about their diet and sleep patterns. A computer program will track changes in the participants' mood and memory.

Studying participants at the South Pole will compare the conditions at McMurdo to an even colder environment. If cold is the major factor in T3, it should be equal or greater at the colder South Pole station than McMurdo.

By comparing light treatment with the thyroid supplements, Palinkas hopes to determine how much of the Polar T3 is related to darkness and how much is related to cold temperature.

Light therapy has been used successfully in a variety of mental disorders and behavioral changes including PMS, sleep disorders and Seasonal Affective Disorder. SAD, as it is known, is a form of depression that is usually linked with the change of season.

"Most people with SAD usually become depressed in the late fall and early winter when it starts to become colder and darker," Palinkas said. "A few become depressed in the late spring and early summer."

Palinkas looked for occurrences of SAD in people at the South Pole in 1991. He found no cases over summer and only a handful over winter.

He did discover that many people experienced sadness, fatigue, lethargy, carbohydrate craving and social withdrawal, especially in the winter.

Palinkas refers to this as subsyndromal SAD. He said S-SAD is not a psychiatric disorder and would not warrant treatment with antidepressants or psychotherapy, but that people with those symptoms have benefited from light therapy.

Because of this, there is a common belief that reduced light exposure in winter is responsible for SAD.

"However, the evidence from our previous research on the Polar T3 suggests that exposure to cold (even in people who spend most of their time indoors) may be associated with the increase in metabolism and change in thyroid function that is associated with the change in mood and behavior," Palinkas said.

Palinkas believes SAD, S-SAD and the Polar T3 may be related. Not only are many of the symptoms the same, they are also both more likely to occur in winter than summer.

Some (but not all) studies of patients with SAD have reported changes in thyroid function similar to those found in people experiencing the polar T3. In all three conditions, resting metabolic rate increases even though they feel more fatigued.

Antarctica has a reputation for being a dangerous place, yet the most common worries for people headed here are social, according to Christchurch psychologist Gary Steel, who has studied mood patterns in people at New Zealand's Scott Base.

"The chief challenges people mention prior to going down are not so much the environment as the social aspects."

Even with the stress of isolation, cold and unvarying light or darkness, Steel said the number of people who experience problems are still the minority.

"Most people do extremely well. They not only survive, but thrive. There are also positive aspects – heaps of them. That's the sunnier side."

To help explain the dark side, the research goes on.

"With each study we learn something new. People are incredibly helpful because they're so curious about what's happening to them," Reedy said. "And because they can see it will help others in the future."

> "Evidence from our previous research suggests that exposure to cold... may be associated with the change in mood and behavior."
>
> - Researcher Larry Palinkas

## Antarctic Photo & Writing Festival

### Four photo categories:

*(One entry per category per person)*

- **Scenic**
- **Wildlife**
- **People**
- **Other**

Photos may be digital or traditional, preferably at 300 dpi

### Four writing categories

*(One entry per category per person)*

- **Poetry:** Up to 30 lines
- **Haiku:** Traditional 5-7-5 syllable poem
- **Micro-fiction:** Up to 300 words
- **Non-fiction:** Essays, letters home, e-mails, memos, journal entries, etc.; up to 300 words

**DEADLINE: 7 A.M. DEC. 14**

*Outlook users, e-mail entries to MCM-Antarctic Sun, others to antsun@polar.org, or stop by the* Sun *office at Building 155.*

*More rules: One entry per category per person for both the photo and writing contests, so choose your best. The contest is for photography and art with an Antarctic theme. This will be broadly interpreted. You do not have to be on the Ice to enter. Winners will be printed in the* Sun*, on the Web and posted on Highway 1. E-mail staff for more info.*

Photo by Brien Barnett/The Antarctic Sun

*South Pole residents and visitors relax in the new dining hall on the upper floor of the elevated station, which is under construction near the old dome.*

# Building

From page 1

outdated structural, environmental, code and safety controls, and communication and data transfer technology, according to South Pole National Science Foundation representative Jerry Marty.

This time, the problem of snowdrifts has been addressed by putting the entire station on columns that can be jacked up when required.

After five years of construction, work has been completed on the fuel storage, garage, shop, and new power plant, as well as four segments of the elevated station. In March 2003, the first two wings of the new station were occupied. For the first time the winter staff lived, ate and sometimes worked under one roof. The 36 residents enjoyed walking to breakfast in their slippers instead of four layers of extreme cold weather gear.

"It was almost cush," said winter heavy equipment operator Rob Shaw. "It was definitely a dramatic change. It was a lot of fun just to be one of the first 36 people to occupy the new station."

South Pole engineer Patrick Hovey described the accommodation as "almost like a hotel room. I could not have done a winter in the old living quarters."

Previously, winter residents were housed under the protection of the dome but the walk to the dining room still required a heavy layer of protective clothing.

The new rooms are single occupancy and will eventually have telephones and computer network connections.

Of course, some people go to the South Pole to enjoy the extremes. Dan Naber has chosen to live in one of the Jamesway buildings at the summer camp.

"I like having a brisk walk each morning to help wake up and feel what the day has brought," he said.

Photo by Brien Barnett/The Antarctic Sun

*Tim Nicoll, an IT tech for Raytheon Polar Services, sits in one of the dorm rooms at the new elevated station at South Pole.*

**"It was a lot of fun just to be one of the first 36 people to occupy the new station."**
***- Rob Shaw***

With the construction still underway, Naber finds the summer camp more peaceful.

"I like the lived-in feel of the Jamesway," he said.

No matter where you choose to sleep, everyone at the South Pole eats in the new, roomy dining area.

"We were all pretty proud of the new dining facility," Shaw said. "There is more seating and windows overlooking the geographic and ceremonial South Pole."

This winter, Polies watched the week-long sunrise from the windows of the dining hall. After six months of darkness, watching the sun make its annual appearance over the horizon was a spectacular event.

"To see that from the new dining facility is fabulous. Everybody was so pumped up," Shaw said.

The winter work focused on the indoor construction of the module that will house communications and medical facilities, as well as the store, the greenhouse, a quiet reading room and personal computer workstations, according to Hovey.

"It's 80 percent done now. They are planning to have it done by the end of summer," Hovey said.

Winter construction work is confined to indoors and can be limited by the isolation of winter, when planes don't fly.

"If you're short of materials, you have to wait," Hovey said.

This summer, outdoor construction will continue on the metal framing and panel enclosure of the fifth and sixth segments of the elevated station. Work will also be done on the emergency power plant, housing, administration and communications, according to Marty.

The entire elevated station project is not due for completion for another four years, according to Ric Morris, director of Facilities Engineering Maintenance and Construction for the Antarctic program.

The next big construction project for South Pole will be building the shield and support structures for a new 8-meter telescope, according to Morris.

Measuring 43 meters in diameter and 17 meters high, the shield that goes around the telescope will be equivalent in size and shape to the old dome. "But upside down," Morris said. "We're starting the engineering work and are buying materials this year to be on next years'

**See Building on page 10**

Photo by Kristan Hutchison/The Antarctic Sun

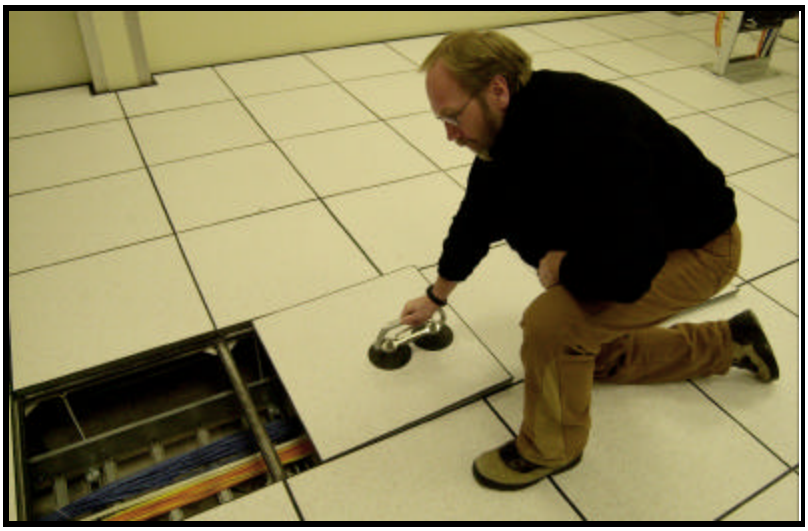


Photo by Kris Kuenning/The Antarctic Sun

*Above, older buildings slated for replacement at Palmer Station. At right, construction coordinator Tom Cohenour pulls out a tile at the nearly-finished J-SOC building. The removable flooring allows easy access to cables.*

# Building

From page 9

vessel for work starting two summers from now."

## McMurdo modernizes

"This year is a fairly slow year as far as construction goes at McMurdo," Morris says.

Three projects are being completed this summer, said Randy McEndree, McMurdo Facilities, Engineering, Maintenance and Construction manager.

A new Science Support Center has been constructed and is in use this season.

Final touches also are being made to the Joint Spacecraft Operations Center, which will become home to the McMurdo Information Technology department as well as NASA Polar Satellite Operations.

A new wastewater treatment plant is already operational, but a final lift station will complete the system this summer.

Future construction planned at McMurdo includes upgrades to the power and water plant in 2005 to improve the station's emergency capability, Morris said.

Three more bulk fuel tanks will arrive by ship at the end of the summer, while old tanks are being demolished to be shipped back to the U.S. along with the deconstructed remains of the old Science Support Center building.

Other things in the near term, which are not yet funded, are new living spaces and trade shops, Morris said.

He said the plan for the new dormitories may include four-story buildings along the road to the ice pier with single rooms and shared bathrooms.

Buildings are continually being phased out and replaced by newer, more efficient ones.

"The buildings in McMurdo are fairly old. There are some from the 1950s, a lot from '60s and early '70s, that are not designed for what they're being used for. New building is dictated by function, safety requirements and somewhat by aesthetic," Morris said.

"McMurdo was set up as an expedition site so there was no real planning when it was started."

Town planning for the future includes separating the living and recreation areas from the industrial areas without expanding the existing size of the town.

## Upgrading Palmer

"We live for upgrades here," said Palmer Station Manager Joe Pettit.

Palmer Station has been upgraded twice in the last five years, with renovations to the laboratory, boathouse and primary living quarters. The remodel created a noise buffer between the lounge and bedrooms, and added a women's bathroom.

In the lab, new counters and shelves made the area easier to work in and keep clean, while fans made it safer to work with chemicals.

"That was a great thing for the community and the science," Pettit said. "The scientists come in and if they're comfortable they get a lot more done."

The next major project at Palmer will be a building to house instruments tracking changes in air quality, the atmosphere, and seismic activity. The 140 square meter building is scheduled for construction in 2005.

"It should have a positive impact overall. Again, it will be replacing a rather archaic building," Pettit said.

Currently those instruments run inside three wooden buildings uphill from the rest of the station, with the weatherbeaten look of an old, blue cabin.

The new building will be a unique triangular building with many windows to take advantage of the view of mountains and water. Raytheon Polar Services architect Steve Meredith designed the three-sided structure to represent the three organizations that will use the International Monitoring System building.

"They all said that their air sampling stack had to be the highest. You can see how that would go," Meredith said. "I had three entities and I had to put them in the building as far apart as possible, and the triangle was born."

One of the three entities is the group of Comprehensive Test Ban Treaty monitors, which will pay for the $500,000 building.

Support columns and closets will fill the three corners, so all the inside space will be useable.

One of the challenges at Palmer is finding a level place to build. The entire station clings to a rock peninsula, sloping from a glacier down to the water. The new building will be built high on the hill, beside the buildings it is replacing. Elevated even higher on columns, the new building will stand out.

"As an architect, I always strive for aesthetics in my buildings, something unique," Meredith said. "I think that's why someone would hire an architect."

In the long term, Palmer will need a new pier to replace the original pier. The existing pier was built in 1967 from sheet piling, set on bedrock and backfilled with rock. The pier is sufficient for the *Laurence M. Gould*, but doesn't extend into deep enough water for the *Nathaniel B. Palmer* to tie up.

The new pier won't necessarily accommodate the *NB Palmer* either, though if it extends another 15 feet out with a slight change in orientation the *NB Palmer* could tie up, said Morris.

So far, a number of ideas have been floated, including a solid concrete pier, a floating barge tied to the shore, a jackup barge that secures to the rock with extendable legs or extending the round piers that are there. The cost estimates range from $5 million to $6 million, but it will be three to 10 years until it is funded and built, Morris said.

"There are some cost advantages to several of the designs, but no decisions have been made," Morris said.

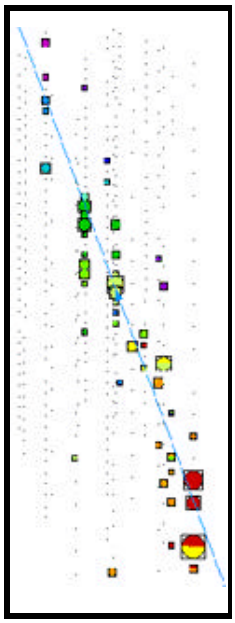
# Amanda From page 1

sphere to detect neutrinos. The more hits the better.

While Morse described the detection of the neutrinos and creation of the sky map as an achievement, he described the data as "not yet conclusive." That's because nearly all the neutrinos in the map were produced locally, relatively speaking, by cosmic ray collisions with nuclei in the Earth's atmosphere. They are not the high-energy "extraterrestrial" neutrinos from other galaxies and black holes scientists are seeking. To find those neutrinos, much more data must be collected.

"You have to basically start hunting for hot spots of neutrinos. And the way you start hunting for hot spots in the sky is you just have a lot of data," Morse said. "There's no substitute for having a lot of data."

The sky map is limited by the amount of neutrino data AMANDA is able to collect. On average, the telescope receives about 10 million events of some kind a day or about 100 per second. Those events are collected into about 10 GB of data a day and analyzed using specialized software and banks of computers back in the United States, according to Darryn Schneider, the project's information technology manager. The output of data reveals that only about three to five neutrinos are detected each day.



*The path of a particle through the telescope. It enters at the bottom and triggers detectors as it goes through.*

In 2000, AMANDA detected 1,555 neutrino events and very few, if any, were considered extraterrestrial. Morse said the telescope has counted about 5,000 neutrino hits to date. It seems like a lot, but it's not.

According to Webster's New World Dictionary of Science, about 10 million neutrinos from the Sun alone will pass through your body by the time you finish this sentence.

"The beauty of the neutrino is also its curse," Morse said. "The very fact it's so antisocial means that it's able to traverse billions of light years … [which means] it can't interact with anything. The chance of it interacting with our detector is one in a billion."

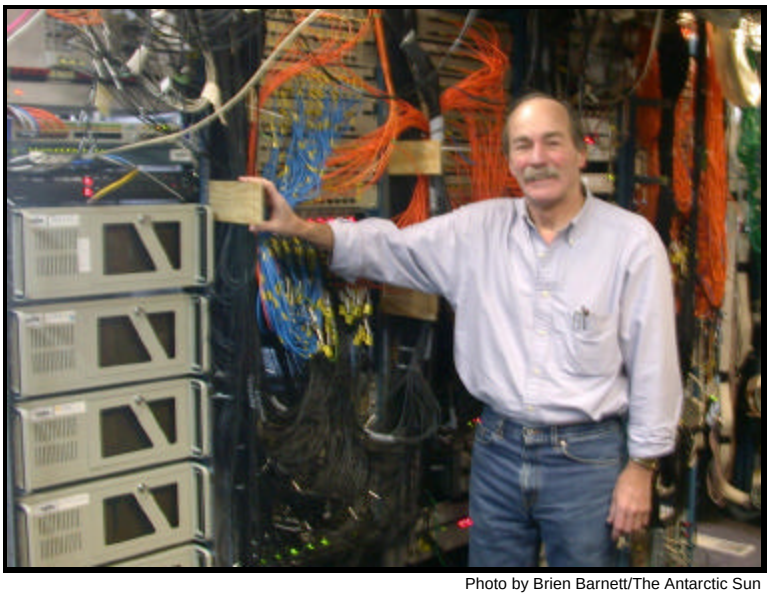


Photo by Brien Barnett/The Antarctic Sun

*Researcher Bob Morse points out the wiring and electrical hardware that sort data coming from detectors in the AMANDA telescope. The hardware is inside the MAPO building at South Pole station.*

The data collected so far do not indicate any substantial patterns that researchers can use to focus their work, he said. More time and perhaps a bigger telescope, such as the project planned at South Pole named IceCube, will help bring the origin of the universe into better focus, he said.

Francis Halzen, a physics professor and theoretician at the University of Wisconsin, Madison, said AMANDA has proved its worth as a concept neutrino detector. The telescope has grown in size as the concept gained focus, starting with six strings of light detectors and growing to 19 strings covering an instrumented area of about 0.2 km wide by 0.5 km deep or about 1/60th of a cubic kilometer. AMANDA is not quite the optimum size for a neutrino telescope, which is one cubic kilometer, but is still enough to show results and set up the potential for discovery.

"It has contributed technology to do neutrino astronomy," Halzen said by telephone from Madison. "It has become big enough, although not a kilometer cubed, it has reached the size where it has made contributions to science."

Halzen describes AMANDA as a true test of technology. Halzen credited the National Science Foundation and Raytheon Polar Services for providing support and managing the logistics of the time and materials intensive project. The team overcame early problems, such as bubbles in the ice, by drilling deeper.

"I think that actually why AMANDA worked is we were lucky," Halzen said. "We were lucky when it comes to the clarity of the ice."

The highest-energy neutrinos from AMANDA have painted what Morse called a "foggy" picture of possible point sources of extraterrestrial neutrino sources.

"I believe we are seeing evidence for a diffuse extraterrestrial neutrino flux from the highest energy neutrinos," Morse explained.

More time spent collecting data or expanding the telescope, beginning with the initial IceCube strings, may result in a clearer picture.

"Our data show the detector works," Halzen said. "Whether there are faint signals beyond the atmosphere, I don't know. We will know when we have analyzed all of our data."

Halzen said he expects a paper about AMANDA's discoveries to be published in a few weeks in *Physical Review Letters*, the American Physical Society's journal.

AMANDA, though, will continue to gather data and every bit helps.

"This is not a resolution problem at present, this is a numbers problem," Morse said.

And, if he begins to get a lot of data pinpointing neutrino sources, then what?

"If there's one of anything, there's a million out there." Morse said, smiling broadly. "Neutrinos tell you there is the interaction of ordinary stuff. Protons and neutrons, the stuff we are made of … That indicates that whatever is out there producing that is stuff we're familiar with."

And that is what astrophysicists want to know most: What is the rest of the universe made of and what is happening to it. AMANDA and its successor may reveal discoveries as yet unimagined.

"People take pictures of the sky using visible light, blue, red, X-rays, radiowaves. Each time people have made a picture of the sky using a different technique they have seen totally different things," Halzen said. "We can discover things that I can not tell you about right now."

# Profile Skip Owen

# Sea stories

By Kristan Hutchison
*Sun staff*

Skip Owen knows every ship in the Antarctic program inside and out, even one that hasn't been built.

He started out as a deckhand in 1983, on the Antarctic program's first research vessel, the *Hero*. Now he's project manager working on the design specifications for the next polar research vessel. He's also one of about 10 people who take turns as marine projects coordinator aboard the vessels. Essentially, he acts as a liaison between the scientists, support staff and the ship crew.

"It can be a very difficult job on a very scientific cruise," said Owen, who specializes in cruises requiring small boat and mooring work, and sometimes ones no one else will take.

Difficult or not, he does it well, say those who have been on board.

"I love that guy. Twenty years and he's not pretentious," said Mark Furnish, waste manager for the Antarctic Program who was on a September cruise on the *Laurence M. Gould*. "He knows his stuff."

Owen can hold his own for hours over a couple of pisco sours in a Punta Arenas pub. Just don't ask him to verify anything he says.

"We don't call it complete B.S. It's a sea story," said Owen.

Owen was born in New Hampshire, but he really grew up in Maine, where his family spent summers on an island in Penobscot. He spent almost as much time on the water as on land.

"I grew up in boats, small boats, lobster boats," Owen said.

When it came time for college he enrolled in a merchant marine training program with a minor in marine science at the University of South Maine. In part, he wanted a career that would keep him out of the office and give him large periods of time off. When he graduated he had his choice between a position on the Oregon State University research vessel or the *Hero*.

"I just was 'Hmmm, Antarctica, that sounds interesting,'" Owen said.

He started the year after the Antarctic program switched ports from Ushuaia, Argentina to Punta Arenas, Chile.

"It was a pretty small operation here. We had an agent, but we did all the clothing issue," Owen said.

He moved up quickly, from deckhand to second mate. In those first years Palmer was a seasonal station, closing completely in the winter. When the *Polar Duke* replaced the *Hero* in 1984, Palmer Station and the marine operations both became year-round.

Owen remembers arriving at Palmer Station during one of those first winters. It had been a particularly difficult one at the station, with personality clashes. The ship arrived to an empty and unshoveled pier. None of the station paths had been cleared and nobody was out. They finally had to push open the station door against the pile of snow blocking it in order to get in and find the winter crew.

When the National Science Foundation decided it needed another vessel, designed specifically for Antarctic research, Owen worked on the design and construction of the *Nathaniel B. Palmer*. In 1992 he was on the *NB Palmer's* first trip to the Antarctic. It happened to be into the Weddell sea ice camp.

"It was quite a challenging trip for its first," Owen said.

Having crossed the Drake Passage more than 50 times, Owen has seen his share of bad weather. Usually a four-day trip, the 1,450 kilometer voyage once took nine days on the *Hero* and seven days on the *Duke*. Particularly bad seas once took out windows on the bridge of the *Duke*, Owen said.

Photo by Kristan Hutchison/The Antarctic Sun

*Skip Owen returns from launching instruments off the back of the* Laurence M. Gould *during a September cruise across the Drake Passage.*

Another time on the *Duke* a plywood storage cupboard holding about 100 cases of soda broke open.

"We had these cans of soda rolling everywhere and everything was drenched in this sticky stuff, which actually made for good walking," Owen said.

More often he just has to handle the human effects of rough seas, from broken limbs to seasickness.

In August, Owen returned to the Antarctic program after a few years running a small boat for the Marine Environmental Research Institute in Blue Hill, Maine.

Between stints with the Antarctic program, Owen also ran his own small boat businesses, ferrying passengers around the Penobscot Bay and lobstering.

Owen still has a lobster license, and a seven-meter lobster boat named *Euphoria.* But he also owns land in Mariaville, Maine, not far from his parents, siblings, nieces and nephews. He's planning to build a home there, using recycled and green materials and alternative energy sources. So far he has the site cleared and a three-season camp set up on a shed with electricity.

"I've done my share of 150-year-old home remodels," said Owen, who spent several years working on the old farmhouse on his family property on Matinicus Island. "Working on an old house, it's kind of a therapy, or an obsession."

The most unusual aspect of his home-to-be, considering Owen's waterborne history, is that it is landlocked, without even a view of the water.

"You start to look forward to that when you spend your whole life on the water," Owen said.