



October 27, 2002

Dressed up with no place to go



Photo by Melanie Conner/The Antarctic Sun

Members of the 109th carry their flight gear through a storm Tuesday at McMurdo Station. The storm grounded all flights to and from McMurdo. Tuesday also happened to be the day the 109th was being photographed for a book "A Day in the Life of the U.S. Military."

Sewage plant coming to McMurdo

By Mark Sabbatini
Sun staff

For years McMurdo Station has discharged tens of thousands of gallons of raw sewage a day into the sea only a few hundred yards away. That will change this season when a long-planned sewage treatment plant opens.

The plant is scheduled to go online by mid-January and be fully operational by the end of the austral summer, said Joyce Jatko, environmental officer for the National Science Foundation. She said other projects have had a higher priority as the U.S. Antarctic Program has worked to address needs with higher environmental risks such as replacement of old fuel storage tanks, but

the completion of the plant is still exciting. "It's been a while coming and it's good to see it finally happening," she said.

The environmental impact of the plant is likely to be significant near the area where the water is discharged — known as the out-fall — and will be studied in-depth by researchers. One scientist said it could take decades for the area to return to normal because of the extremely cold conditions. Jatko said she doesn't know if it will take that long, but there's no way to predict if it will be a few years or many years before significant changes are seen.

About six to eight McMurdo workers built the exterior of the structure during the

Taste of victory

Roald comes in first again, this time as an ice cream flavor

By Mark Sabbatini
Sun staff

What ingredients would you put into an ice cream named after an Antarctic explorer who ate his dogs?

Former McMurdo Station worker Dave Weber will get a pint of Ben & Jerry's ice cream every week for a year for his recipe, selected by the company as the best of nearly 400 entries in a contest to find the best Antarctic-themed flavor. His entry, "Roald Almonds-en," consists of chocolate ice cream with toasted almonds, toasted coconut and chocolate chips.

The flavor's namesake, Roald Amundsen, made history by being the first to reach the South Pole in 1911. Rations were often crude and scarce for polar explorers of the era, but Amundsen went to great lengths to ensure he had enough food — including the rather controversial act of eating the dogs he brought along to help haul sleds.

"Well-known for its flavors with name-plays, like Cherry Garcia, Chunky Monkey and Chubby Hubby, the Vermont-based company found Dave's suggestion to be the best," wrote Deb Lisman, McMurdo's housing coordinator last season and the organizer of the contest, in a statement

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Icebergs chip away at the old ice block

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Quote of the Week

"It was out of the refrigerator and into the freezer."

- Man coming to Antarctica after working in Alaska

Ross Island Chronicles

By Chico

I see there's a new group of scientists setting up a camp near here. Let's figure out a way to make money off them.

Let's sell them all those jars of pickled eggs we found in Robert Scott's old hut.

Good evening gentlemen. We have here the last stock on the continent of polar bear testosterone. It's guaranteed to make you as virile as satyrs in rut.

What do you think we are? Dummies? Everyone knows there are no polar bears in Antarctica

And this is the reason why.

And they say global marketing doesn't work.

I'll take ten Do you take credit cards?

Cold, hard facts

Blood Pressure

Number of people who got blood pressure checks in McMurdo last Sunday: **30**

Approximate number of people who didn't get checked: **795**

Highest blood pressure: **150/100**

Lowest blood pressure: **108/60**

Median blood pressure: **118/80**

Average blood pressure of adult Americans: **120/80**

Normal arterial blood pressure for dogs: **90 to 110**

Blood pressure of Weddell seals: **150/110**

Drop in heart rate when Weddell seals dive: **90 percent**

How Weddell seals maintain blood pressure when they dive: **By restricting the blood flow to the heart, lung and brain.**

Sources: Antarctic Fire Department, Mike Castellini, HealthyPets.com

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Katabatic Crosswords: All the -ologies

ACROSS

- 4 Science as applicable to the legal profession
- 8 The science of the nerve system
- 10 The science of glaciers
- 11 The science of rocks
- 15 The science of water
- 16 The science of Earth physics
- 17 The science of life
- 18 The science of humans
- 19 The science of dinosaurs

DOWN

- 1 The science of weather
- 2 The science of space
- 3 The science of organisms and their environment
- 5 The science of matter and energy
- 6 The science of oceans
- 7 The science of animals.
- 9 The science of microscopic life
- 12 The science of fish
- 13 The science of chemicals and substances
- 14 The science of the functions and activities of life

Solution on page 13

Squares too small? No pencil to erase your mistakes? Try our interactive online puzzle at www.polar.org/antsun

Sewage

From page 1

polar winter after the materials for the plant — weighing as much as 2 million pounds — arrived in pieces on the *Green Wave* cargo vessel last February, said Ric Morris, director of Facilities, Engineering, Maintenance and Construction for Raytheon Polar Services Co.

“You can image during the dark and the cold it’s not easy,” he said. On a similar construction project the year before workers could only be outside 30 minutes at a time and “when it’s windy, all of the roof panels and side panels, you can’t put them up.”

About 30 people are working on the guts of the plant this summer, preparing three 12-by-12-by-75-foot storage tanks and rerouting sewage pipes to go through the plant, said Dale Jacobs, senior construction coordinator at McMurdo.

“It’s a stationwide project,” he said.

Morris said the 170-foot-by-140-foot plant costs about \$6 million and will be able to treat up to 121,000 gallons of sewage a day. It can be expanded to five tanks able to process 160,000 gallons if necessary.

The facility is similar to a standard municipal treatment plant, but designed to treat the higher concentration of waste that results from McMurdo’s efforts to conserve water, Jatko said. That means a larger holding time so the bacteria that break down the sewage have a longer time to work.

“I had a professor that used to call it bugs,” she said, referring to the bacteria that are part of a person’s normal digestive process. “It’s bugs and bugs don’t care what the organic source is of their food. They just know it’s a good thing to eat. You need enough time for the bugs to eat their food.”

The plant will discharge water that meets secondary treatment standards, but not those for drinking water, Jatko said. McMurdo gets its drinking water through an expensive desalination process, but Jatko said treating wastewater would be even more expensive — and impractical.

“It is possible to treat sewage and turn it into drinking water, but people wouldn’t drink it,” she said.

McMurdo’s sewage also differs from a typical municipality’s because it is all organic, since chemicals and other materials are discarded separately and shipped back to the United States. That means the only residual left after the bacteria break down the waste are the dead bacteria cells themselves, which will be dried into a material resembling wet peat moss that will be sent back to the U.S.

“The simplest way to think of them is bug bones,” Jatko said. “They’re the cell wall of dead bacteria. You need to get the



Photo by Melanie Conner/The Antarctic Sun

Ten-inch pipes will carry up to 121,000 gallons of wastewater a day into the new treatment plant when it starts working in January.

bones out of the system.”

The plant, when finished, is designed to be operated by a single person who can monitor all its operations, Jacobs said. It is also designed to handle large fluctuations in population, since there are fewer than 200 people at McMurdo during the winter and more than 1,000 at times during the summer.

“You have bacteria living and dying in

“This is the right thing to do, that we minimize our impact on the continent.”

—Ric Morris, construction manager

cycles depending on how much food is coming in,” Jatko said. “During wintertime there are about 150 people. Winfly happens (during the spring) and in a week the food coming in is now doubled. Well, your bugs don’t reproduce that fast. With this system we have the capability to retain the wastewater for longer in the tank as the (station) population starts going up.”

The plant has a bypass system that will allow untreated water to flow directly into McMurdo Sound if a power failure or other significant problem occurs, Morris said.

Monitoring the effects of the treatment plant on the environment will be a long-term process, said Stacy Kim, an adjunct professor at Moss Landing Marine Labs in California. She and five others are collecting a year of pre-treatment samples and two years of post-treatment samples for an NSF-funded project, which will be added to data collected in 1988 about the effect

of pollutants in the area.

Organisms that live in this region of the marine environment were significantly affected by the sewage outfall, according to previous research. These organisms, which can include invertebrates and bottom-feeding fish, are often important recyclers of nutrients otherwise trapped in sediments.

Estimates are the sewage outfall left a pile 120 feet long and 50 feet wide in the sound, which turned white from a bacterium that took eight years to digest four months’ worth of sewage. But Kim said the environmental impact appeared to be limited in scope.

“The (organic) community near the outfall changed, while farfield communities did not,” she said.

Her team’s project will examine recovery speed in a polar environment, as well as comparing that performance to more temperate locations. Kim said “it will be a big shock” to the bacterial system now in the sound, but the pile of waste is large and “it might be decades before that pile disappears.”

Jacobs estimated about 140 changes have been made to the original treatment plant design so far, such as rerouting piping and using more durable stainless steel tanks instead of the epoxy tanks originally called for.

“Name something and it probably has been changed,” he said.

But all the planning and effort is more than worth it as far as Morris is concerned.

“I feel like this is the right thing to do, that we minimize our impact on the continent,” Morris said. “It’s not like it’s a high-tech thing. It’s done in every town and every city in the world.”



Perspectives Perspectives

Great men lead, fools follow

By Phil Jacobsen

Stepping out the back door of my dormitory I walk in the footsteps of the great Antarctic explorers, like Shackleton, Scott and Amundsen. Men who came to this continent, fighting scurvy and snow, to be the first to set foot at the South Pole. Adventurers and heroes. Foolish men are not welcome in such a harsh climate, until now.

Last week my friend Penny arrived in Antarctica. The plane she flew on, a C-141, landed on a runway built by shaving the top layer of ice from the frozen Ross Sea into a semi-smooth, slick and rutted tarmac. Twelve feet of ice or four months of thaw was all that separated her plane from the cold water, seals and starfish.

It had been eight months since I'd seen Penny. It took her 20 seconds to recognize who I was. The last time we saw each other was at the Raytheon Antarctic job fair in Denver. The job fair where I stood in an hour-long line hoping to wash dishes in Antarctica, and she stood in a line to get the job to clean the toilets in Antarctica. At the time, I was a graphic designer. She managed a record store.

Now, with a frostbitten nose, ears, dishpan hands and four weeks without sunshine, the Dishwasher greeted the Janitor.

What had I learned here? What did I need to tell her to help her transformation into this climate? After six weeks on the Ice, was I now a sage? The Dali Lama of living chilled to the bone.

"Penny," I said, elated I now had a confidant and friend on this continent. "Think of all the people who have ever stood where we're standing now. Scientists, explorers, great men and women and Dishwashers and Janitors. Of all the people who have ever come to Antarctica, how many people do you think have ever stuck their tongue on a piece of metal in the freezing cold? Let's be the first!"

"Did you just say, 'stick my tongue on metal?'" Penny said. "Exactly whose test did you copy when you took the psychological examination?"

"His name is Ryan. You'll like him. He's a sociologist and a Janitor. I figured he knew all the right answers."

We spoke very little after this, even



Photo by Penny Chilton/Courtesy of Phil Jacobsen
Phil Jacobsen waits in a fish hut.

though there were months between us.

In the week that followed we got to know McMurdo, together. Climbing Observation Hill. Walking to Scott's Hut and staring over the sea to the Royal Society Mountain Range at a sun who rarely sets. And when she does the entire sky is colored like a box of Neapolitan ice cream, without the chocolate, but with colors like peach, turquoise and four other odd shades of blue.

There have been a few times, when the moment has just seemed right. Like when it was minus five and the sun was riding low over the horizon casting lots of light, but emitting no heat, I'd turn to Penny and say, "See that pole over there. I bet if you had a cup of coffee at the ready, I could touch the pole with my tongue, and the coffee would allow for my tongue to gently detach from the metal."

"No."

At the top of Observation Hill, wind blowing 27 mph, the thermometer on my jacket zipper pull pegged at minus 30, 15 feet from the cross honoring the death of Robert Scott, there is a metal plaque describing the history of that exact spot.

"Let's put our tongues on the plaque. They might not freeze instantly to brass, but this would be a historically significant

moment in a historical area."

"No."

With every picturesque view, Penny saw the mountains and I saw the metal. It got to the point where Penny could say "No," almost as fast as I could find a place to stick our tongues. Then our schedules changed.

My morning shift was changed to the afternoon, which meant if I went to bed early I'd be dog tired by the end of washing dishes for 10 hours. So I'd try and stay up until 2 a.m., sleep until 10 a.m., wash dishes from 11 until 9 p.m. — times six days and that's dishwashing math.

Maybe it was my third night of staying up late by myself or maybe it was the fifth, but at one o'clock one morning, with the sun still shining bright, I found myself standing alone in minus 20 weather next to the sign that says, "McMurdo Station Antarctica." A wooden sign, I might add, held up by two metal poles.

Penny wasn't there to say "No," and my senses may have been dulled by the minus 61 wind chill factor, but I walked up to the sign, stuck out my tongue, and CRACK. I've never heard ice freeze so fast. PAIN. It was like eating glass. STUPID. I didn't take an IQ test to come here, just a physical and psychological examination.

My tongue stuck to the pole as though the pole had been a part of my appearance since the day I was born.

"What a cute baby," people may have said to my parents 35 years ago, "and my, oh my, what a big pole he has on the tip of his tongue."

It may have been minutes, it could have been seconds, but it seemed like hours that I was attached outside with my tongue held firmly by the grips of stupidity.

I thought about the footsteps of the great Antarctic explorers, like Shackleton, Thcott and Amdundthen. I looked at the colors of the Thun shining off the peaks of the Royal Thothiety Mountains.

Fearing I'd be found there stuck to the pole in the morning by the fire department, or worse yet, Penny, I took my fingers, ripped my tongue from the pole, half for me/half for it and said, "Thoot man, that Thucked."

Phil Jacobsen is a dining attendant.

around the continent

SOUTH POLE

Still waiting for first flight

By Judith Spanberger
Pole correspondent

Today is Oct. 24, the day South Pole Station ends the 8-month-long winter isolation and greets the summer crew. Yesterday was the official day for the first flight, but flights were cancelled due to bad weather. But today is a new day and we're ready. We are so ready. Well, sort of. We 51 winter-overs have been on our own here for the last 8 1/2 months. There are a lot of mixed emotions on station about this time. Sadness at it ending and joy at re-entering the "real world."

One of the two LC-130 skier planes coming in today launched a few hours ago, but turned around and went back to McMurdo due to mechanical problems. The air here at Pole was thick with anticipation and excitement. How will things change? What will the new people be like? Will we see how much we ourselves have changed after seeing them? Delaying the flights certainly isn't helping to calm things down. To keep my mind off my own internal machinations I walked around station and asked people how they felt about the arrival of the plane. Here are some of the responses. No names to protect the innocent (ha!):

"I just want them to get here. It's time to pass the baton."

"They put all of this time into the ski-way; they might as well use it."

"I hope there are some hot babes on that plane."

"If they don't get here I can't leave."

"Here come the bad people."

"It's as if winter was a different reality now. Winter's gone, now it's summer."

"Anxious. I'm not sure if I want them here or not."

"Whatever."

When the summer community gets here we can show them everything we've accomplished. Several of the five pods on the new South Pole Elevated Station have been transformed from a shell with barely a wall to rooms with lighting, ductwork, walls painted and fixtures installed. The new gal-

ley is open and sunny thanks to the light walls and many windows. The berthing in one of the pods is also very close to complete, as are the adjoining bathrooms.

In the world of science this was a year of interesting accomplishments. The Climate Monitoring and Diagnostic Lab (CMDL) of the National Oceanic and Atmospheric Administration (NOAA) monitors, among other things, our ozone hole. This year the hole split into two lobes and was pushed from over the Pole to the edge of the Antarctic continent. This occurred at the time when normally we would have the



Photo by Jon Berry/For The Antarctic Sun

The 51 South Pole winterers near the end of their season.

minimal value of ozone above the Pole. As a result of the hole's drift the people at CMDL observed above average values of ozone. Eventually one of the lobes disintegrated and the remaining lobe drifted back over the Pole returning the status of the ozone hole to normal.

DASI (Degree Angular Scale Interferometer), a research program based at the University of Chicago, was able to establish important data about the polarization of the radiation leftover from the Big Bang. The characteristics had been theorized up until now, but this year's work together with last year's provided proof these characteristics exist. An article on the work recently appeared in the science journal *Nature* titled "Polarization on the Cosmic Microwave Background."

The Antarctic Sub-millimeter

Telescope/Remote Observatory (AST/RO), based at the Harvard Smithsonian Center for Astrophysics, is a research group that looks at molecules in the galaxy in an effort to discover how stars and planets form out of gas clouds. This winter they completed a map of the galactic center region, and found and are observing a large gas structure that's collapsing and about to form a group of new stars.

The Antarctic Muon and Neutrino Detector Array (AMANDA) is a neutrino telescope built and run by a dozen institutions in four countries. A neutrino is a fundamental particle in the electron family that has no charge and is therefore not deflected by an electromagnetic field. They interact weakly with other matter and simply keep on going and going. The scientists here were able to establish systems that allow them to isolate the neutrinos right away rather than have to send off the data and wait months for results.

We feel like winter has been productive and successful and now it's time to step back, admire our work and hand over the reins.

We just got word flights were cancelled today due once again to bad weather. We'll have to wait one more day (or two or three...) to get answers to our questions and pass on the responsibilities. Then again, what's one more day (or two or three...) after 365? Stay tuned for next week's article from Pole when we talk about the first flight of summer. We hope.

PALMER

Shuttling to and fro

By Tom Cohenour
Palmer correspondent

The ship schedule simply refers to it as "first shuttle" and "second shuttle." Those

See Palmer on page 6

the week in weather

McMurdo Station
High: 18F/-8C Low:-4F/-21C
Wind: 56 mph/89 kph
Windchill: -46F/-43C

Palmer Station
High: 30F/-1C Low:7F/-14.5C
Wind: 37 mph/59 kph
Melted precipitation: 2.4 mm
Snowfall: 2 cm

South Pole Station
High: -46F/-43C Low:-71F/-57C
Wind: 26 mph/41 kph
Windchill: -125F/-87C

Palmer From page 5

terms may conjure up visions of space travel for the uninitiated, but for folks deploying to, or redeploying from, Palmer Station, it signifies turnover.

Turnover is the semi-annual ritual where one season's support staff leaves and the following season's staff arrives. This transition unfolds over a two-week period involving two port calls, or shuttles, by the research vessel *Laurence M. Gould*. Each port call is usually three days in length, involving off-load of cargo, passengers, fuel, gifts, and a send-off with handshakes, hugs and tears.

The first shuttle this season was extended by two days to allow additional testing and adjustment of the station's fire alarm system. John Chan, Pacific Division (PACDIV) Fire Marshal was present along with National Science Foundation Safety Inspector, Harry Mahar, who, in conjunction with several Raytheon Polar Services employees, conducted the work.

The inspection of the newly remodeled Biolab laboratories started immediately upon arrival of the *Gould*. Quality craftsmanship was found throughout the project and the new labs were given approval for immediate occupancy. The entire 4,300 square feet of the first floor was gutted over the winter. All new subfloor, walls, plumbing, wiring, lighting, cabinets, counters, ventilation, and vinyl were installed. In all, nine new labs were constructed along with a new autoclave room, instrument tech office and dark room.

Progress photos of the project can be viewed at www.polar.org/Public/Photos/PalmerRemodel/index.htm

In all, 16 new people arrived and 17 departed during the first shuttle. An additional 11 people came down for the five-



Photo by Laura Hamilton/For The Antarctic Sun

Seal seen near Palmer Station.

day port call to conduct a variety of tasks such as inspection or maintenance and departed on the same ship.

The second shuttle saw the arrival of another 16 people and departure of 12. An additional four people arrived for the three-day port call to carry out inspections and maintenance.

One of those four was Sandy Bright, a delightful lady who performed specialized maintenance on several microscopes including the Nikon E800. Sandy worked for 15 years as a research specialist with Nikon. She also trained researchers at Woods Hole in microscopy. In her current position as a microscope consultant, she trains scientists and techs in microscope use, works with scientists to determine their needs, and makes recommendations to Raytheon Polar Services Co.

Just before reaching Palmer, the second shuttle stopped at Admiralty Bay, King George Island, to open Copa, a small science camp located half a mile over a mountainous ridge from the Polish base Arctowski. The annual Copa opening is directed by Raytheon Polar Services Special Projects Coordinator John Evans, a 15-year veteran of the Antarctic Program. Assisting were 28 personnel, including Bright, who serviced the microscopes.

"Power and heat were started within a few minutes," Evans wrote, "but snow removal continued for most of the day — including the substantial excavations required to free up the support cables for the wind generator tower. The high-frequency radio antenna anchor points never were found; temporary snow anchors were substituted at the approximate points, and high frequency communications established with Palmer Station. Iridium and Inmarsat C communications were also verified."

"While en route back for the completion of the Copa operations, our first zodiac was surprised to be hailed by another in the distance. It was a Brazilian zodiac from Ferraz, which experienced a motor failure during a fishing trip near shore and had blown far out into the bay. The Brazilian zodiac had been unable to raise anyone with their small VHF radio, and quite naturally were extremely thankful we were in the area and able to tow them back to Arctowski."

The departure of the second shuttle means turnover is officially over and summer has begun at Palmer.

Continental Drift

What did you miss most about the Ice?



"This is the only job I ever did that I ever, ever enjoyed...I just like to come down here and work."

Dave Sandison, South Pole heavy equipment officer from Moberly, Missouri



"Being part of the Palmer community and spending time with so many multi-talented people."

Barb Watson, Palmer Station instrument technician from Kitty Hawk, N.C.



"Cash."

Dave Bolton, McMurdo Station refrigeration technician from Denali, Alaska



Icebergs and sea ice mix below a colorful spring sky near Palmer Station.

Photo by Linda Hamilton/Special to The Antarctic Sun

For ice, it's not so hard to do

By Kristan Hutchison
Sun staff

Sometimes the headlines make it sound like all of Antarctica is breaking up and melting down.

"Ice shelf collapses in largest event of last 30 years..." "124-mile-long iceberg breaks off..." "Connecticut-sized iceberg breaks free..."

In the 26 years the National Ice Center has tracked Antarctic icebergs, the last three years hold the record for both size and number. Typical years the continent produces from zero to seven bergs big enough to make the charts, basically anything 11.5 miles or longer. But both 2000 and 2002 brought bumper crops of a dozen bergs each. The only year on record with more bergs was 1979, when 14 bergs floated away, and most of those were smaller, from 350 to 800 square miles. B15, the biggest berg on record at 4,179 square miles, broke away in March of 2000.

"We don't know why icebergs like B15 and C19 calve when they do. We don't know whether there's an environmental trigger," said Doug MacAyeal, an iceberg researcher at the University of Chicago. "In the middle of the night something happens and you wake up the next morning and one of the cracks has connected through to make the piece come off."

MacAyeal and most other iceberg experts separate the recent break up events into two categories. There are all the icebergs calving off the continental ice sheets, which seems to be part of a natural process of trimming and regrowth.

Then there's the massive meltdown on the Antarctic Peninsula, where rising temperatures in the last decade have been decomposing the ice.

"The enmass disintegration of the Larsen (ice shelf) into thousands of smaller icebergs that takes place instantaneously along

See Breakup on page 8

Jan. 1995: Northernmost section of the Larsen Ice Shelf, called Larsen A, collapses in a storm following an unusually long, warm summer. About 770 sq. miles disintegrates. At the same time, a large iceberg (674 sq. miles) broke off the ice shelf front farther south.

Jan. 5, 2000: B14 (383 sq. miles) calves off the Ross Ice Shelf.

March 19, 2000: Iceberg B15 (4,181 sq. miles) and B16 (233 sq. miles) calve off the Ross Ice Shelf. At 170 miles long and 1,000 feet thick, B15 is the largest iceberg recorded.

A few days later, B15 breaks into two parts, named B15A and B15B. B15B floats away and shatters into smaller pieces, tracked all the way to B15I. B15A, now generally called B15, is stuck near the entrance to McMurdo Sound.



Icebergs run aground near Palmer Station. Small icebergs, those the size of a refrigerator or car, are called bergy bits. Ones a little bit larger and mostly submerged are growlers.

Photo by Linda Hamilton/Special to The Antarctic Sun

Breakup From page 7

the surface of the ice shelf, that's a totally new phenomenon," said Eugene Domack, a geologist at Hamilton College. "It's due to, clearly, a warming of the region in the summer over a number of years."

Peninsula falls to pieces

Iceberg experts knew the Larsen B Ice Shelf on the east side of the Antarctic Peninsula was going to go. They'd seen the turquoise meltwater pooling on top and noted the volumes of freshwater cascading down. They even remembered when Larsen A fell apart in 1995.

In November 2001 an Argentinian researcher put Larsen B on a watch list because of the warm spring temperatures and a 20 percent increase in the water melting off the ice shelf.

Even so, everyone was surprised by the way the Larsen B went, shattering in 35 days like a plate of glass dropped on cement. Shards the size of refrigerators, cars, houses and aircraft carriers spun off, about 730 billion tons of ice in all. Thousands of icebergs clattered in the Weddell Sea, leaving open water where there'd been 1,250 square miles (3,250 sq. km.) of ice shelf a month before.

"They look so solid. Last year we cruised along the front of the Larsen B and this thing is huge. You are standing on the bridge of the *Nathaniel B. Palmer*, up five stories, and you're looking eyeball to eyeball with the front of the Larsen B," said Robert Gilbert, a geographer from Queens University in Kingston, Ontario. "Then in a month it's gone. It just breaks up into little chunks of ice and floats away."

Gilbert, referring to an idea by David Vaughn of the British Antarctic Survey, compared the Larsen B to a Roman arch, which collapses completely if the center keystone is removed. The front of the Larsen B was supported on two ends by land, but when the shelf front crumbled back far enough to lose its grip,

the entire structure fell apart.

The Larsen B also may have disintegrated quickly because it was in the shadow of the peninsula, protected from the clockwise pattern of wind and current. While the Worde Ice Shelf on the other side of the peninsula was more gradually broken back since the 1930s and 40s, the Larsen B stayed intact as it weakened.

The melt pools on top of the ice shelf also sped the disintegration, said Ted Scambos, a research scientist at the National Snow and Ice Data Center in Boulder, Colo. The water seeped into cracks and its weight acted like a wedge, splitting open the ice.

Those dynamics explain the how, but not the why, of the ice shelf's demise. For that researchers look to the temperature gauges. There's general consensus that significant warming on the Peninsula caused the Larsen B's break down.

The Peninsula warmed more than 4 degrees Fahrenheit (2.5 C) since the late 1940s. Last summer was warmer still, setting records. The Larsen A also fell apart in a year when the summer melt extended 20 days longer than average.

The changes are obvious to people who've worked at Palmer Station for years and watched the glaciers near there.

"There are areas where the glacier used to reach a certain point and it's calved back so there are islands," said Bob Farrell, who's worked seasonally at Palmer for almost a decade.

One glacier looks like it's about to break through, opening up another cove, Farrell said.

Domack also noticed signs of melting on a science cruise last September. On James Ross Island and in a nearby fjord they found waterfalls cascading down from the ice, some falling 1,000 feet.

"We went in front of these tabular icebergs and there were

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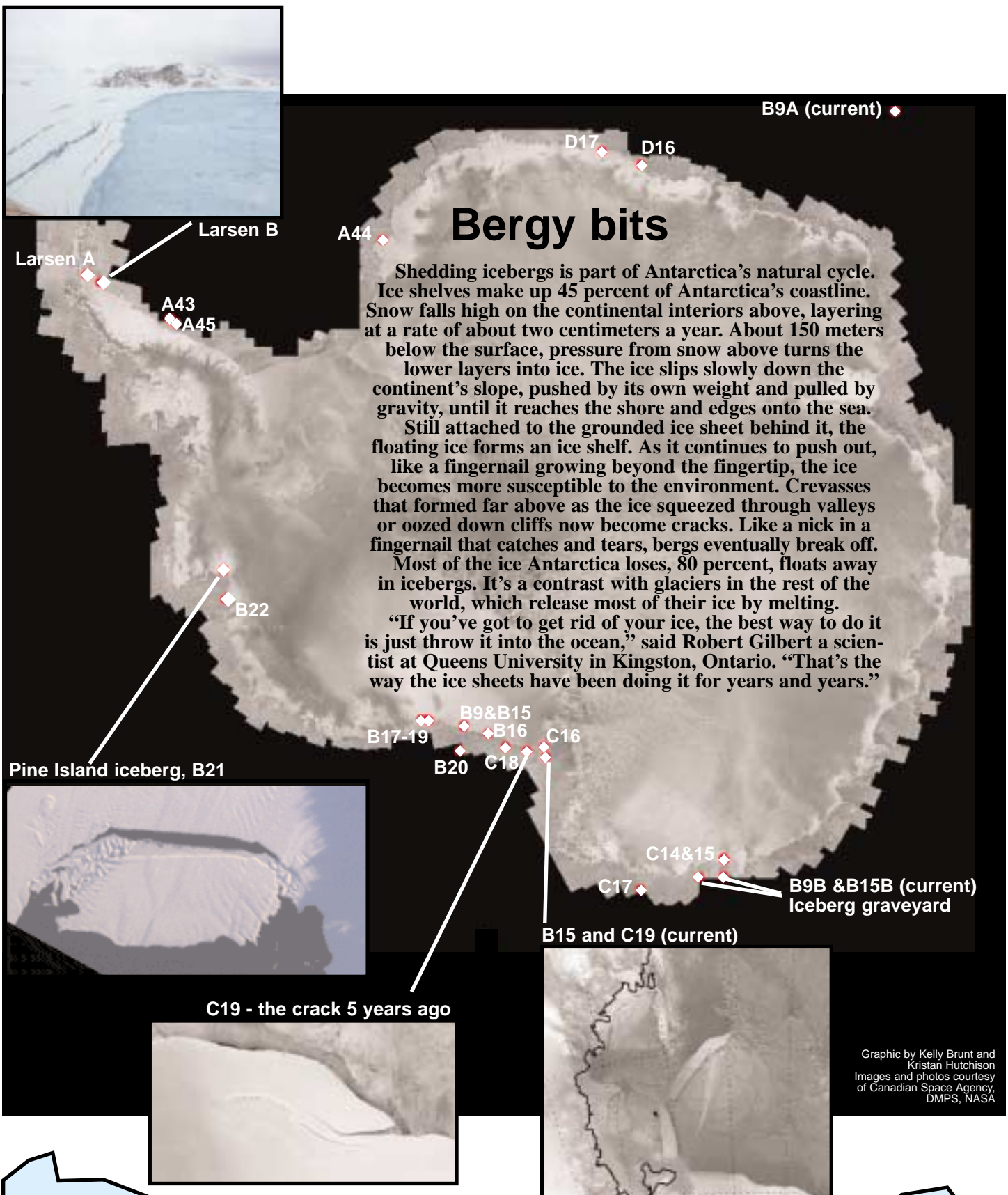
Size of Connecticut:
4,872 sq. miles.

April 2000: B17 (745 sq. miles) and B18 (79 sq. miles).

June 13, 2000: B19 (121 sq. miles) calves.

Sept. 28, 2000: B20 (344 sq. miles) calves.

Oct. 15, 2000: D16 (138 sq. miles) calves.



Bergy bits

Shedding icebergs is part of Antarctica's natural cycle. Ice shelves make up 45 percent of Antarctica's coastline. Snow falls high on the continental interiors above, layering at a rate of about two centimeters a year. About 150 meters below the surface, pressure from snow above turns the lower layers into ice. The ice slips slowly down the continent's slope, pushed by its own weight and pulled by gravity, until it reaches the shore and edges onto the sea. Still attached to the grounded ice sheet behind it, the floating ice forms an ice shelf. As it continues to push out, like a fingernail growing beyond the fingertip, the ice becomes more susceptible to the environment. Crevasses that formed far above as the ice squeezed through valleys or oozed down cliffs now become cracks. Like a nick in a fingernail that catches and tears, bergs eventually break off. Most of the ice Antarctica loses, 80 percent, floats away in icebergs. It's a contrast with glaciers in the rest of the world, which release most of their ice by melting. "If you've got to get rid of your ice, the best way to do it is just throw it into the ocean," said Robert Gilbert a scientist at Queens University in Kingston, Ontario. "That's the way the ice sheets have been doing it for years and years."

Pine Island iceberg, B21

C19 - the crack 5 years ago

B15 and C19 (current)

B9B & B15B (current) Iceberg graveyard

Graphic by Kelly Brunt and Kristian Hutchison
 Images and photos courtesy of Canadian Space Agency, DMPS, NASA

Feb. 26, 2000: A43 (2,215 sq. miles) calves from the Ronne Ice Shelf in the Weddell Sea.

Feb. 28, 2000: C14 (166 sq. miles) and C15 (198 sq. miles) calves.

Feb. 9, 2001: A44 (69 sq. miles) calves from the Ronne Ice Shelf.

Sept. 4, 2001: A45 (69 sq. miles) calves from the Ronne Ice Shelf in the Weddell Sea.

Oct. 2, 2000: C16 (345 sq. miles) calves from the Ross Ice Shelf.

Breakup From page 8

large cataracts of water pouring off,” Domack said. “We’d never seen anything like that in all our cumulative years of experience on the coastal zone, so we got the sense that this year was something real unusual.”

Water samples in front of the ice shelf also showed an unusual amount of freshwater mixing with the seawater, as did phytoplankton blooms.

The Larsen B Ice Shelf has shrunk to 40 percent of its previous size. It’s a particularly dramatic change considering evidence Domack found on the seafloor below the Larsen B indicating it’s the first time the shelf area has been ice-free in 12,000 years.

Larsen B isn’t the first, or last, to go. Seven ice shelves around the Antarctic Peninsula retreated in the last half of the 20th century. In all, the peninsula has shrunk 5,200 square miles (13,500 sq. km) since 1974. It may shrink more still. Though the Larsen C, the next ice shelf down the peninsula, doesn’t look ready to collapse, Scambos believes it’s the next to watch.

Continental chips off the old block

The continental ice shelves tell a different story. State-sized bergs dislodging in the last few years are just part of the normal lifecycle, bringing the ice shelves back to where they were when Scott and Amundsen raced for the Pole a century ago.

“Healthy ice shelves apparently go through a cycle of grounding out into the ocean like a fingernail, and then calving off,” Scambos said.

A dozen icebergs already calved this year. Many were big enough to draw attention, most notably C18 and C19.

“My best guess is it’s a coincidence that they happen to sync up in the year 2000,” Scambos said.

The barrage of bergs from February to May has Scambos wondering if there might be an iceberg season at the end of the Antarctic summer. That would imply the continental calving is also influenced by temperature, occurring at the end of the warmest season.

In the last few years the Filchner, Ronne and Ross ice shelves all calved back to the position they were at a few decades ago.

The Ross Ice Shelf may even be far enough back it could be possible to break the record Amundsen set when he sailed the *Fram* further south than any other ship had been.

“Right now, because of all these bergs breaking off, you can break that record,” Scambos said. “I want to be on the ship when they do.”

Amundsen thought he was on solid ground when he launched his successful race for the South Pole from the edge of the Ross Ice Shelf. He built his camp, Framheim, on

See Breakup on page 12



Photo by Josh Landis/Antarctic Sun file photo

Iceberg B15, once the biggest ever recorded, sheds into the Ross Sea. Now almost half its original size, B15 is stuck near the entrance to McMurdo Sound.

90 percent of the world’s icebergs break off Antarctica, but most stay nearby, trapped by the current circling the continent.

Nov. 14, 2001: B21 (276 sq. miles) calves from the Pine Island Glacier into the southern Amundsen Sea.

Feb.-March 2002: Portion of Larsen B Ice Shelf (1,250 sq. miles) collapses over five weeks ending March 7. It was 650 feet thick and about the size of Rhode Island. The Larsen B Ice Shelf on the eastern side of the Antarctic Peninsula had been in place since the end of the last ice age about 12,000 years ago. The Larsen Ice Shelf is now about 40 percent its original size. By mid-April five icebergs are identified from the shattered shelf-A46 to A50.

Size of Rhode Island: 1,212 sq. miles.

March 5, 2002: Iceberg C17 (58 sq. miles) broke away from the Matusевич Glacier of the Ross Ice Shelf into the northwestern Ross Sea.



Photo by Josh Landis/Antarctic Sun file photo

Iceberg B15 is 23 miles across, from edge to edge and 100 feet tall, which means another 900 feet hang below the waterline.

Big bad bergs

By Kristan Hutchison
Sun staff

For people at McMurdo Station, big bergs are a big concern, especially when they threaten to get in the way of the ice breakers and resupply ships.

B15 is still loitering at the gate and C19 isn't far off.

Reaching 70 to 100 feet above water and another 900 feet below, B15 changes the flow of water and wind that usually pushes out some of the sea ice in McMurdo Sound.

"I remember seeing C16 from a helicopter and saying 'Wow, look at that' and somebody saying 'That's the little one,'" said Kelly Brunt, a Geographic Information Systems analyst at McMurdo Station. "These things are 70 to 100 feet high and you see it in front of a Coast Guard ice breaker and it just looked like a big pancake. You're so overwhelmed by the x and y extent that you forget the z."

Last year the National Science Foundation decided to call in both Coast Guard ice breakers to cut a path through the unusually thick and wide ice. Then a December storm and record high temperatures in January thinned and broke out some of the ice.

"We had two world-class weather events that helped out," said

Ted Scambos, a researcher at the National Snow and Ice Data Center.

The B15 problem remains, but the sea ice outlook published by the National Ice Center Oct. 11 suggests one ice breaker can do the job this year. The sea ice extends farther than normal, about 48 nautical miles from McMurdo. That may cause the channel opening date to be later than normal, according to the forecast.

Also of concern are the icebergs themselves. Icebergs C16 and B15 seem to be trapped, said Andy Bliss, a graduate student at the University of California, Berkeley. Bliss and University of Chicago researcher Doug MacAyeal put equipment on B15 two years ago to track its movements.

C16 is grounded and helping to hold B15 back. Pulled by the tide and moon's gravitation, B15 jiggles in impatient ellipses, bumping regularly against Franklin and Beaufort islands and C16, Bliss said. Like a bumper car without reverse, it can't get out of the corner it's stuck in.

B15 is also in a bit of a hole. Atmospheric lows off Cape Bird

See Bergs on page 12

April 2002: Iceberg B22 (2,120 sq. miles) and B23 (397 sq. miles) calve from the Thwaites Ice Tongue in the Amundsen Sea.

Size of Long Island: 1,377 sq. miles

May 5, 2002: Iceberg C18 (216 sq. miles) calves off.

May 13, 2002: D17 (24 sq. miles) calves from the Lazarev Ice Shelf, extending into the southeastern Weddell Sea.



Photo by Josh Landis/The Antarctic Sun files

Technicians set up instruments on iceberg B15 to track its movement.

Bergs From page 11

cause the sea surface to bow slightly.

"It may be a few centimeters over a few kilometers," MacAyeal said. "Normally people like you and I won't notice that, but an iceberg this size would notice it because it would be like being on an inclined plane."

So B15 keeps slipping downhill.

A crack that Bliss and MacAyeal had predicted would break the berg in two over the winter never did, even when C19 rammed into it, though a collision on May

12 did free C16 for a few days.

The bigger concern this year, for a while, was C19. After breaking off on May 14, C19 had pivoted back and forth at the far end of B15. If it stayed there it might further disrupt the usual breakup of sea ice. This week C19 dodged B15 completely, putting it on the path to open water.

Those watching hope it will follow the route of the iceberg before it, the much smaller C18, which seemed to swim across McMurdo Sound and up the coast,

moving 174 miles in a month. The route is a typical one for icebergs in the Ross Sea, which often end up in an iceberg "graveyard" near Cape Adare.

"C19 has a good model to follow and if we can just guarantee it will move at that pace we don't have to worry about the ship," said Brunt, who will give a talk Monday in McMurdo on icebergs of the Ross Sea. "(The ships) may have to zig and zag, but the impending doom of McMurdo Station is greatly exaggerated."

May 14, 2002: Iceberg C19 (2,356 sq. miles) breaks off the Ross Ice Shelf on a fissure scientists have been watching since the 1980s. It returns the Ross Ice Shelf to the size it was in 1911, when it was mapped by Scott's party.

Size of Cyprus: 2,277 sq. miles

Future:

The next portion of the Larsen Ice Shelf, known as Larsen C, is losing stability and could go.

Future:

Stress fractures near the eastern tip of the Drygalski Ice Tongue and along the entire western base have become more evident.

Breakup From page 10

the shelf edge. It calved away long before the National Ice Center started tracking icebergs with satellites in 1976.

Years before B15 made headlines, the world watched B9 break off near the same spot in October 1987. Little America, a research station established by Admiral Richard Byrd in 1929, went with it. Fifteen years later B9 is still floating, caught in the current circling Antarctica. Along the way it split in two and shrunk, but Scambos likes to imagine it may still be carrying Byrd's old snowcruiser, a mobile science lab that Byrd designed and built. It drove only five to 10 miles before getting stuck in soft snow. Unable to free it, Byrd had to leave it there.

"It calved off with the iceberg and it's out there somewhere," Scambos said.

That's the eventual fate of everything on the continental ice, which is all slowly sliding toward the sea. The bodies of Robert Scott and his companions in their tent will eventually, or may already, be buried at sea. So will the original South Pole station and the current station's sewage in another 100,000 years.

Dropping huge chunks of ice into the sea is normal for Antarctica, like a snake shedding its skin. But how to define normal becomes difficult when you expand the time scale. Antarctica's icy reach has varied many times in the last 25 million year. Philip Bart is looking back 50 million years, to a time when the Ross Ice Shelf extended 250 km further. Go back further in time and the continent was warm and unglaciated.

That doesn't absolve humans from changing the climate and environment by doubling the level of carbon dioxide, said Gilbert.

"What people should realize, and one of the reasons that people should be interested in it, is that although Antarctic ice is at the other end of the world both figuratively and literally, whatever happens on one part of the world effects the rest of the world," Gilbert said.

Icecream From page 1

announcing the winners.

It is not known if the company will market the flavor. The gourmet ice cream maker agreed to sponsor the contest at the end of the 2002 austral summer for participants in the United States Antarctic Program, but made no promises beyond the year's supply of ice cream for the winner.

Lisman, who approached the company about the contest, knew company co-founder Jerry Greenfield when it was just starting up more than 20 years ago. She had won a good-natured bet 14 years ago about who could climb the highest on a Nepal trek. The winner supposedly would get to name a Ben & Jerry's flavor, but Lisman — years later — decided to see what ideas Antarctic program participants could come up with.

Among the names submitted: "The Ice," "Antarctic Frostbite;" "McMurdo Melt," "Polar Plunge" and "Penguin on a Stick."

Some submissions were "very innovative, even outrageous; others may have had less global or marketable appeal, but were still quite funny or clever to those 'in the know,'" Lisman wrote.

In addition to Weber's winning entry, the company named four runners-up:

- Fourth runner-up: Devin Lamma, "Shackleton's Salvation," consisting of rich vanilla ice cream loaded with solid milk chocolate seals, dark chocolate covered peanut butter penguins and a smooth marshmallow "Herbie" swirl.

- Third runner-up: Joel Foy, "Erebus Crystals," consisting of a coconut-flavored snow-white ice cream base with bits of dark and milk chocolate and a few almond slices and toffee bits included.

- Second runner-up: Beaver Cohen, "Fire n' Ice," consisting of vanilla ice cream with cinnamon red hot candies, fudge swirls and marshmallow swirls.

- First runner-up: Michael Caldwell, "Polar Tuxedo," made from white and milk chocolate penguins and candy cane poles in mint ice cream.

Foy, who returned to the Ice this season, said his flavor's name "was just an available choice that fit the region."

"My flavor is basically a frozen Almond Joy," he wrote in an e-mail. "I always liked the concept of coconut and chocolate



Photo courtesy of Deb Lisman
Deb Lisman outside the Ben and Jerry's headquarters in Vermont.

together. The dark and white color combination fit the local environment well, and I reasoned after four months on the Ice, more than a few people are fantasizing about tropical isles, coconut palms, etc."

"I thought (the name) it was good because it was a connection to the only known active volcano on the continent."

Ben & Jerry's has sponsored only one major flavor contest, asking consumers in the United Kingdom to come up with the ultimate British flavor in 1996, he added. The winner was Cool Britannia, containing vanilla ice cream, strawberries and fudge-covered shortbread. Runners-up included Grape Expectations, Rolling Scones, Minty Python and Stiff Upper Lip.

The company also welcomes flavor suggestions from anyone at its Web site at www.benjerry.com.

Answer to p. 2 crossword



*All hail those penguins
Hero's meal, gift shop appeal
Stupid as a log*

Think you can do better?
The Antarctic Writing Festival is coming
Haiku, poetry, short story and non-fiction
Keep it short, make it good
Enter by 7 a.m. Dec. 16 to The Antarctic Sun - McMurdo
Only one entry per person, per category.
All entries under 300 words or 30 lines for poetry.



Profile

By Kristan Hutchison
Sun staff

50 degrees of separation



Photo by Kristin Cobb/Special to the Sun

Alice Doyle, right, works with Andres Sepulveda aboard the Nathaniel B. Palmer in April to launch a sensor.

Alice Doyle escaped the Bermuda Triangle to end up floating below the southern cross. Except for the 50-degree difference in temperature, she found working on an Antarctic research ship similar to her previous job as a lab technician in Bermuda.

"It's just a lot colder water and a lot prettier place," said Doyle, who packed away her shorts five years ago to sail away on the *Nathaniel B. Palmer*.

For five years before then she'd been working for a long-term, open-ocean research project, taking monthly water samples from a site 42 miles offshore. The research vessel, *Weatherbird II*, was famous for its sickening ride, which turned out to be good training for crossing the Drake Passage on the *Nathaniel B. Palmer*, said Doyle, who rarely gets seasick.

She first boarded the *Palmer* as a "peon tech" for a science team studying carbon fluctuation in the Southern Ocean.

"It was just one of those times in life when you need a change," said Doyle, who'd already made several big changes, moving from her hometown outside Chicago to the University of Virginia for a chemistry degree, then on the Bermuda.

The following year Doyle returned to the *Palmer* as assistant lab supervisor. She worked her way up to science cruise coordinator, and recently was promoted again to marine supervisor. She's spent about 12 months at sea over the years, plus a four-month season at Palmer Station.

As science cruise coordinator, Doyle was in charge of helping the scientists with everything from the process of required physicals to getting permits to making sure all their equipment made the boat.

"Once it misses the ship, you don't have it," Doyle said.

Inevitably something would be missing, broken or forgotten and need to be replaced in Chile before they left port. Sometimes the part has to be manufactured in Punta Arenas, most recently

a 100 pound weight without any exposed metal.

"Getting stuff in Punta Arenas can be difficult," Doyle said. "You'll go into a store and they'll sell you nuts and bolts and women's clothing and washers and driers."

Though Doyle knows some Spanish, she usually resorts to show-and-tell shopping. She shows them what she needs. They tell her if they have it.

"It's always funny to go shopping, because you've got a pocket (full) of stuff," she said.

At sea, science goes around the clock, so any time she's awake she's working.

"A lot of the sampling is monotonous, day after day you're doing the same thing," Doyle said.

After a while life on the ship can feel like the movie "Groundhog Day," in which the main character wakes up each morning to relive the same day, Doyle said. That's why stints on board are limited to three months.

"That's a long time. People get tired by the end of that," Doyle said.

But Doyle never seems to wear out.

"She had more energy than just about anyone on the boat," wrote Kristin Cobb, who was on a science cruise with Doyle in April. "She was just always moving and doing three things at once."

Doyle's hardwork drew the attention of the National Science Foundation and she was among a dozen or so people who received certificates of appreciation at the annual planning conference this year.

Al Sutherland nominated Doyle for her outstanding performance managing the Global Ecosystem Dynamics Southern Ocean Cruises, a two-year project involving eight winter cruises and 18 principal researchers.

"The success of this program is, in no small way, due to the professionalism, perseverance, talent, hardwork and exceptional people-skills of Ms. Doyle," Sutherland wrote in a statement read at the award presentation.

Doyle balances hardwork with hard play. A competitive runner, Doyle runs regularly, even at sea.

"Other people ran on the treadmill, but she actually ran fast on the treadmill," Cobb wrote. "I was impressed. She still competes in running, even though it's got to be hard to stay in competitive shape when you're spending a good chunk of your year in Antarctica."

Staying in shape while at sea allows Doyle to do the things she loves when she gets back on dry land – hiking, biking, skiing and other outdoor sports. She recently hiked the Inca Trail in Peru and Torres del Paine in Chile.

"I like challenging myself in that way too," Doyle said.

Though Doyle now has a desk job in Denver, the sea is still calling. She expects to continue deploying occasionally on the ships.

"We're a big, moving science platform and that's kind of neat. You're constantly going to different areas," Doyle said. "There is something new each trip that makes me think 'Wow, I have a pretty cool job.'"