The Antarctic Sun

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January 19, 2003

Waiting for a ride

Photo by Joan Myers/Special to The Antarctic Sun

Following a tradition started with the photographers who recorded the early Antarctic explorers, photographer Joan Myers was in Antarctica this season as a guest of the National Science Foundation. A selection of her photographs starts on page 9, and can be seen at www.polar.org/antsun in full color.

A first for second icebreaker

Arctic ship Healy deployed to McMurdo to help clear path

By Kristan Hutchison
Sun staff

As the icebreaker *Polar Sea* chips away at the sea ice in front of McMurdo Station, a second icebreaker is on its way to help escort supply vessels through the channel cut in the unusually thick and extensive ice.

The backup breaker will be particularly important since the U.S. Coast Guard icebreaker *Polar Sea* broke one of its three propellers Thursday, said Coast Guard spokeswoman Lieutenant Commander April Brown. A 5-ton, stainless steel blade broke off the hub and dropped to the seafloor about 5 miles from McMurdo. The damage can't be fixed before the *Polar Sea* returns to Seattle and was probably the cumulative effect of grinding through difficult ice, Brown said.

The channel was officially 48 nautical miles (55 standard miles; 88 km) long when the *Polar Sea* finished the first cut through on Jan. 9. A few miles of sea ice have blown away since then, leaving a channel through 34-nautical miles (39 standard miles; 63 km) of tough fast ice, as sea ice is called as long as it remains solid and attached to land, plus about 200 miles of very dense pack ice. The distance to the edge of the fast ice can vary greatly from year to year, but in the last 20 years the ice edge normally ranged 10 to 20 miles (16-32 km.), said Al Sutherland, the ocean projects manager in NSF's Office of Polar Programs.

See Healy on page 14

Huge antenna looks at 'ignored' air

By Kristan Hutchison
and Mark Sabbatini
Sun staff

Some call it the "ignorosphere" because it's a portion of the Earth's upper atmosphere that is seldom studied. But it's tough to ignore a new antenna near the South Pole providing data about the rarified air – it's more than four miles long.

Umran Inan is paying attention to this section of atmosphere, hoping transmissions from the massive antenna will allow better detection of problems such as satellite-damaging disturbances caused by solar activity. More formally called the mesosphere and lower ionosphere, this section of the atmosphere is commonly ignored because it lies in a hard to observe area between 30 and 60 miles (50-100km) in altitude.

"It's too high for airplanes, too high for even balloons, but too low for satellites," said Inan, an engineering professor who is the head of the Very Low Frequency Group of the Space, Telecommunications

See VLF on page 16

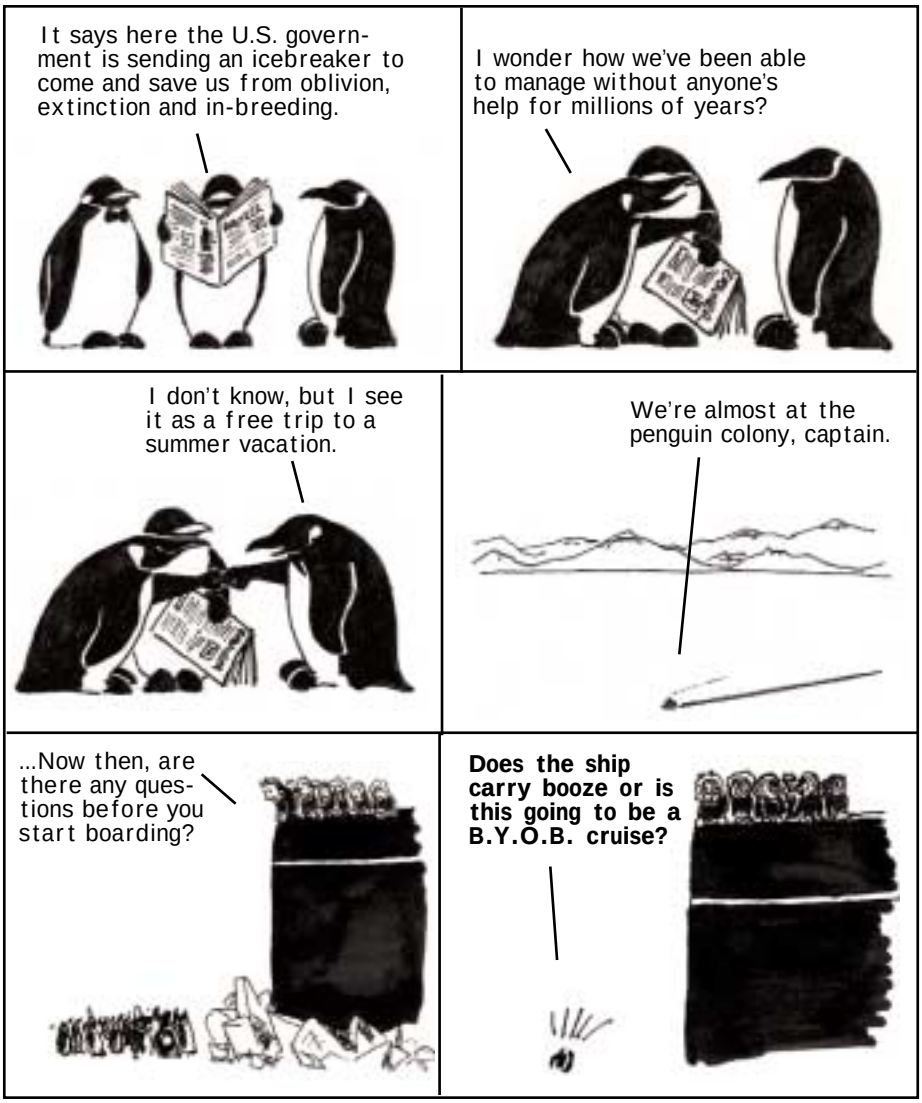
INSIDE

Quote of the Week

"He has spent his entire time trying to convince people that Texas is bigger than Antarctica."

- NSF official referring to a congressman visiting from the Lone Star state

Ross Island Chronicles By Chico



Cold, hard facts

Antarctica on the Web

Number of Google search engine hits for "Antarctica" as of Jan. 16: **2,090,000**

First site: **Australian Antarctic Division (www.antdiv.gov.au)**

Hits for "Antarctica" and "science": **296,000**

Hits for "Antarctica" and "aliens": **13,900**

Hits for "Antarctica" and either "penguins" or "skuas," respectively: **44,200 and 2,470**

News stories about Antarctica: **537**

Top search inquiries at *The Antarctic Sun's* Web site during the past week (in descending order): **penguins, arctic climate, gould, itase to byrd, lake vostok anomaly, library, petrified wood, 2003 calendar**

The Antarctic Sun is funded by the National Science Foundation as part of the United States Antarctic Program. 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.

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

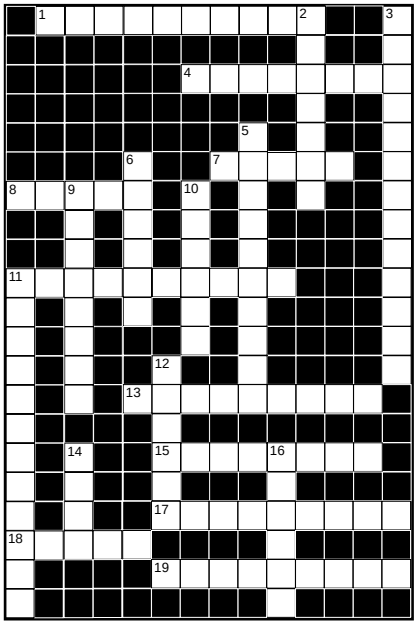
Web address: www.polar.org/antsun

Katabatic Krosswords: Recreation time on the Ice

Across
1. This bowling job on the Ice is almost extinct
4. Boring in classrooms, maybe, but a huge hit here
7. Incredibly, Pole people run all the way around this
8. Win this and the prize may be a boondoggle
11. The Thanksgiving road race at McMurdo
13. The occasional fast-food alternative at McMurdo
15. New Year's music festival at McMurdo
17. A place to borrow everything from skis to CDs
18. Played against the Kiwis on a field of ice
19. This South Pole dinner is a big deal for wintering staff

Down
2. No driving after parties, but these will get you home
4. So dark you have to hear the pins drop
5. Commonly used to describe off-station trips
6. Women's McMurdo performance show near holidays
9. Parties celebrated near, but not exactly on, Jan. 1
10. A "real house" for hosting McMurdo gatherings
11. An unofficial extreme temperature club at the Pole
12. This club offers the rare opportunity to camp out
14. Alternative art show at McMurdo
16. Scott Base hosts these brain games

Solution on page 6



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

LaFratta named new deputy section head

This week Susanne LaFratta assumed the duties of the deputy section head of Polar Research Support in the Office of Polar Programs. As the deputy section head she will assist section head Erick Chiang in providing the overall leadership, coordination and management necessary to oversee the financial, logistical, operational and science support for the U.S. Antarctic Program. She follows Dwight Fisher, who recently retired after 10 years in this position and over 20 years of dedicated support to the program.

LaFratta's education brings financial, legal and project management expertise to the program. LaFratta managed laboratories at Harvard Medical School for 13 years. After earning her law degree at night and practicing law for about a year, LaFratta realized she didn't enjoy the courtroom work as much as the investigations that precede it, so she applied for a job in the National Science Foundation's Office of the Inspector General. As an audit advisor for the Inspector General's office, she did oversight of polar programs and visited Antarctica three times from 1997 to 2000.

She then joined the NSF's Office of Budget, Finance and Award Management, helping them set up a facility management office. In that position she was involved with all of the NSF's facility projects, including the South Pole Station Modernization and IceCube projects.

"I'm really looking forward to being involved again. The program is impressive and it's a world that few people get to see," LaFratta said. "I'm looking forward to the challenges of the job and making a contribution to the program."

The following press release was supplied by the National Science Foundation:

Helicopter crash

Injured pilot, passenger flown to New Zealand for treatment

A helicopter flying in support of the National Science Foundation's Antarctic research program has crashed near McMurdo Station, NSF's science and logistics hub on the continent.

The helicopter's pilot and a passenger, the only people aboard the aircraft, were injured in the incident, which happened at approximately 4:00 p.m. local time on Jan. 17. They were evacuated to New Zealand aboard a New York Air National Guard LC-130 cargo aircraft for medical treatment. Medical personnel accompanied the injured on that flight.

The aircraft arrived in New Zealand at approximately 6 a.m. local time Jan. 18, and the patients were transferred to a local hospital in Christchurch, NZ.

The names of the injured are not being released, pending notification of family.

The helicopter was shuttling cargo to science stations in the McMurdo Dry Valleys, an ice-free area of the continent, roughly 96 kilometers (60 miles) from the station across the ice-covered McMurdo Sound.

Petroleum Helicopters Inc., of Lafayette, La., operates NSF's helicopter fleet in Antarctica. The incident involved a seven-passenger Bell 212 helicopter.

An investigation into the cause of the crash has begun.

PHI flies approximately 1,400 flight hours each season in support of U.S. Antarctic research. This is the first aircraft accident with serious injury for the U.S. Antarctic Program since PHI assumed responsibility for helicopter flight operations from the U.S. Navy in 1996.

Continental Drift

If you could be an Antarctic animal what would you be and why?

"I'd be a Weddell seal because they get to do the polar plunge everyday."
Paul Kolachor,
McMurdo Station dining attendant from Telluride, Colo.

"Put me down for a party animal."
Dave Anderson
South Pole heavy shop foreman from Meridian, Idaho

"A Skua. Tough. Edgy. They could go anywhere in the world to make a living but they pick harsh places like Antarctica. They are working class heroes."
Eric Pohlman
Palmer waste management specialist from Minneapolis

speaking of science...

You're one in a million, baby

By Amanda Leigh Haag

Incandescent lights of austral spring flicker as he gazes at her spiny silhouette; waves of mood music roll in on sea-salt currents; a wisp of biogenic fragrance drifts by; time stands still for a dark eternity, until finally the urchins shed their gametes in streaming yellow and white banners and embrace spring with wild abandon.

Such is the reproductive life of a sea urchin from the Southern Ocean, at least as personified by a member of the Manahan lab. We here in the Manahan lab (a.k.a "Team Larvae") witness this echinoderm courtship regularly in the phase 3 aquarium of Crary lab. In the absence of candlelight or Sinatra, we coerce McMurdo Sound's dominant species of sea urchins to deliver their gametes on cue.

The cue, in this case, involves the injection of a salt that alters the chemical gradient of the sea urchins' cells, resulting in a muscle contraction. An almost immediate release of mature gametes into an awaiting beaker of freezing-cold seawater ensues. Under a microscope slide, one peers down on a brilliant man/woman parody: billions of tiny sperm writhing madly with blind ambition, versus the still-life of large, elegantly amber-hued eggs patiently awaiting their destinies.

In the polar ocean, the onset of the reproductive season for most marine invertebrates coincides with austral spring. The local idiom of "it's a harsh continent" takes on a new meaning to eggs drifting through the polar waters: the Southern Ocean has been devoid of sunlight for six long months, and everything is hungry. It will be months before the sunlight pours forth enough energy to ignite the algal bloom, the primary productivity of the ocean. The seawater is at the lowest temperature it can reach without freezing: –1.8C. It is a survival-of-the-fittest world to the nth degree.

If an egg has a lucky day, it encounters a suitable mate - a lone, viable sperm cell likewise drifting aimlessly through the turbulent seas. Depending upon variables such as gamete concentration and tidal currents, this successful encounter in the vast ocean might literally be a chance in a million. Think of it as the probability of independently bumping into two old high school classmates in a desolate place.

Photo by Doug Pace/Manahan Lab

A pluteus larva is about 3 microns, or .3 mm large.

If the egg and sperm form a viable match, they fuse instantaneously and the egg becomes vacuum-sealed against other suitors (sperm cells that just won't give up) by the instant appearance of a fertilization envelope, or "halo." At this point a new life commences or, in the controlled laboratory setting of our glass beakers, hundreds of thousands of lives commence.

It is at this moment that the laboratory and the ocean diverge dramatically. Fertilized eggs that we place in a gigantic 200-liter culture vessel to grow up, have an "ivory tower" life: They have their pristine vessels stirred gently by circulating, Willy Wonka-sized paddles, their seawater is replaced every three days by grumbling graduate students, and they live uneventful juvenile lives, fed to their hearts' content. According to Allison Green, a fifth-year PhD student, "There's nothing like changing the diapers of a million babies to make you think twice about having kids!"

In contrast, eggs fertilized in the brutal conditions of the polar seas grow up like savages, if they grow up at all. Just as the blueprint for life is being laid out during the first trimester of a human pregnancy, the embryonic stage of a developing sea urchin is the most critical for its eventual success in becoming an adult. Embryos at sea face the impending doom of becoming someone's planktonic snack or being battered by the currents into oblivion.

In the real oceanic world, the amount of embryos that grow up to replenish adult populations is much less than 1 percent. In fact, it's not far from one in a million. These statistics provide us with ample respect for the masses of eggs deposited in our beakers – the females are evolutionarily programmed to produce enough eggs to ensure that at least one will live.

The importance of these microscopic critters and their ability to flourish in the icy Antarctic waters is what brings us all the way from the University of Southern California. In the past few years, the Manahan lab has made some exciting discoveries about the embryos and larvae of one species of local sea urchin, *Sterechinus neumayeri*. Published in the journal Science last summer, our research shows a physiological process ubiquitous to all life forms (protein metabolism) is 25 times more efficient in these embryos than any other organism ever reported. Proteins are important because they are the working machinery of all biological processes. That these growing babies are able to manufacture proteins at such a low energy cost in the freezing waters is astounding.

Our mission this season is to investigate this metabolic efficiency at the cellular and sub-cellular levels in order to understand the nuts and bolts behind it. It's possible that this high-performance metabolic engine is a unique adaptation to life in the extreme cold. Therefore, we are using a three-pronged approach to "look under the hood," as our principal investigator Dr. Donal Manahan likes to put it.

Our first objective is to determine whether this heightened efficiency is found in other closely related animals, such as the local sea stars. David Ginsburg, a PhD student, dives to collect the animals and is doing comparative metabolism studies in various species. A second approach is to look at how the whole organism fares, such as by measuring the oxygen consumption and feeding rates of the sea urchins. Allison Green runs this "overall engine performance" unit, which will ultimately tell us whether the higher efficiency protein metabolism translates into more efficient growth overall. Our final objective is to disassemble the process of protein metabolism by looking at the machinery involved in manufacturing proteins. Dr. Douglas Pace, a post-doctoral associate, and I are studying these cellular and sub-cellular aspects to determine how this metabolic efficiency is fine-tuned.

Perhaps the most remarkable thing to remember is that the "harsh continent" only seems that way to us. These young ones are right at home here, ingeniously adapted to their surroundings - we are the naive onlookers, trying to grasp what they have to teach us.

Amanda Leigh Haag is a research technician in the Manahan lab at the University of Southern California.

around the continent

PALMER

Penhale a part of Palmer

By Tom Cohenour
Palmer correspondent

To say that Polly Penhale has had a big impact on Palmer Station would be putting it mildly. For over 17 years she's helped shape the way science is conducted there.

Penhale became a representative of the National Science Foundation (NSF) when she joined the Office of Polar Programs in 1986 as the program manager in biology and medicine; a position she's held ever since.

Photo courtesy of Tom Cohnour
Polly Penhale visits Palmer Station.

After growing up in St. Louis, Mo., Penhale attended Earlham College in Indiana to complete her undergraduate studies. From there she went on to North Carolina State in Raleigh where she earned her masters and PhD in marine ecology. She also completed postdoctoral studies at Michigan State and the University of Miami.

Remote regions beckoned her early on. She spent two summers high above the Arctic Circle at Point Barrow, Alaska (72 degrees north latitude), working on her masters. Then she moved to the temperate and tropical zones for her PhD.

As a program manager with the NSF, the breadth of her program overview includes research based at Palmer, McMurdo Station, on two research vessels and, to a very limited extent, South Pole Station. She's responsible for recommending support or declination of grant proposals after obtaining peer reviews, for long-range science research planning, and for working as a member of the U.S. delegation to the Convention for the Conservation of Antarctic Marine Living Organisms (CCAMLR).

"The biology and medicine program is one of the largest of the five Antarctic science programs in terms of the number of proposals we receive," Penhale said. "The program is very competitive, with only the very best projects being supported."

Even though Penhale lives and works in the Washington, D.C., area, she still finds time to deploy every year. This season she's at Palmer for a very brief visit of only three weeks.

Her longest stretch on the ice of three months occurred several years ago at Palmer when the research vessel *Polar Duke* was sent to the Ross Sea on the opposite side of the continent.

"I've probably spent more time at Palmer than all other [science] program managers combined," exclaimed Penhale.

One of Penhale's trips to Palmer was very unexpected. In late January of 1989 Penhale suddenly received a phone call informing her that the 435-foot (134-meter) Argentine supply and research vessel named the *Bahia Paraiso* with 316 people aboard had run aground on the rocks near Delia Island only one and a half miles from station.

As it made its way out of Arthur Harbor at Palmer heading to Esperanza, an Argentine station on the peninsula, the *Bahia* struck a jagged rock ripping a 30-foot (9-meter) gash in its hull. Estimates of the amount of fuel that was spilled into the environment from the shipwreck range from 160,000 gallons to 350,000 gallons.

Penhale was called upon to form and deploy a quick-response research team consisting of an array of scientists to conduct an initial assessment of the *Bahia* site. To hasten the team's arrival at Palmer, she flew on a U.S. Air Force plane from the States to King George Island on the peninsula and then went the rest of the way by ship. Once on-site, Penhale coordinated the response team to collect and store organisms for future evaluation.

Often noted as the strongest advocate for Palmer at the NSF, Penhale was instrumental in establishing the Long Term Ecological Research (LTER) program in Antarctica. Prior to 1990, the LTER did not exist in the Antarctic. But after years of hard work and determination by Penhale, in 1990 Palmer Station became the first-ever LTER site outside the United States. The Dry Valleys near McMurdo Station became the second.

The Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) came into force in 1982 with 23 nation members. It's primarily an ecosystem treaty that protects krill and fish in Antarctic waters. As one of the delegates representing the United States, Dr. Penhale travels to Hobart, Tasmania, for annual meetings.

When asked to summarize her work, Polly says, " I see myself as a facilitator for others to do research and help them get grants." And she does it well. Being proactive in the science community is one of her priorities. She conducts workshops and meetings to brainstorm innovative ways to conduct science in Antarctica.

One of Polly's goals is to get science to the general public. Teachers Experiencing Antarctica (TEA) helps achieve that goal. Teachers at Palmer typically have a Web site where they post assignments for their students back in the States. Questions pour in from the students via e-mail and in that method immerse them in facts about Antarctica and raise their awareness of Antarctic geography, biology, and history. One teacher at Palmer asked the construction trades people to come up with real life situations where they use math to solve daily problems. It was a huge success.

And Polly's work with Palmer has also been a huge success. Her 17 years of service has had a big impact on Palmer Station, how science is conducted, and the increased awareness of the biodiversity of the Antarctic continent.

SOUTH POLE

Planning summer's end

By Anne C. Lewis
Pole correspondent

The end of the summer is quickly approaching here at the South Pole Station. The season's last flight is scheduled for Feb. 15. Temperatures are slowly

the week in weather

McMurdo Station
High: 37F/3C Low: 20F/-7C
Wind: 24 mph/39 kph
Windchill: -11F/-24C

Palmer Station
High: 46F/8C Low: 31F/-0.4C
Wind: 59 mph/96 kph
Rain: .22 inches/5.5mm
Snow: Trace

South Pole Station
High: -10F/-23C Low:-25F/-32C
Wind: 18mph/29kph

Pole

From page 5

dropping and anticipation of redeployment has the station abuzz. As work continues summer crew members are also busy finalizing their leisure travel plans. Watching the new station being built and seeing its evolution over the season makes one appreciate the hard work everyone has contributed. Science projects will soon start winding down, with a few groups having already departed. Despite the fact that the end of the season is in sight, there is still a lot of work to be completed.

This week we hosted two groups of visitors, including a congressional delegation. They all set foot at 90 degrees south and enjoyed a day at Pole.

We are keeping our eyes on the horizon for incoming visitors...looking for little dots moving this way across the snow. Visitors this week include a self-guided ski expedition arriving Jan. 15.

The Antarctic Search for Meteorites (ANSMET) field team stopped in at Pole after closing down their summer field camp. John Schutt, meteorite hunter and gatherer, Dean Eppler, space suit crash test dummy (seriously!), Cady Coleman, NASA astronaut (yes, she has been in space!), and Dianne DiMassa, master engineer and robotics genius, shared their summer experiences with us. They also set up a meteorite display outside the Dome.

The cargo department entertained the station last Sunday with its annual cargo carnival. Tug-o-war contests, banana sledding contests, arm wrestling and more! Cribbage is a favorite pastime down here and this week the serious players will participate in a cribbage tournament in hopes of winning some big bucks. Jon Brack's slide show "Around the World in 7 Months - Travels between Antarctic Seasons" will gear everyone up for summer travels. Last weekend out in the summer camp lounge Polies threw a beach party. Looks like redeployment-itis is setting in down here.

Photo courtesy of Anne C. Lewis

South Pole employees play ping-pong at the cargo carnival.

SHIPS

Icebreaking operations reach McMurdo Station

By LTjg Lance W. Tinstman
Polar Sea *Public Affairs Officer*

On Dec. 29 the U.S. Coast Guard icebreaker *Polar Sea* began an 11-day, 52-nautical mile channel break-in to McMurdo Station. The ship encountered ice up to 13 feet thick in the ice channel. This single-ship operation was the longest channel break-in since 1963 when the U.S. Coast Guard deployed three icebreakers – CGC *Glacier*, CGC *Eastwind* and CGC *Staten Island* – to complete the then 67-mile task. However, the 1963 break-in distance was recorded in November. This year's channel was of historic proportions and the longest channel ever recorded this late in the austral summer. *Polar Sea* followed last year's channel, the path of least resistance, as much as possible.

Polar Sea arrived at the ice pier on Thursday, Jan. 9. After a delay caused by a young seal that had lost its way, the sea ice next to the pier was carved away and the ship was moored. *Polar Sea* took on 619,325 gallons of JP-5 Diesel fuel over the weekend, as the crew enjoyed some well-deserved liberty in McMurdo.

On Sunday, Jan. 12, it was back to work for the ship and crew, as *Polar Sea* backed away from the pier at 1 pm. Channel grooming and widening will continue for the next few weeks and will include the creation of turning basins off Hut Point, and at eight- and 15-mile intervals out towards the ice edge. These will provide the ship places to turn around and continually transit the full 15 miles, widening the channel to approximately 200 yards and breaking ice chunks. Southerly winds are anticipated, which will greatly help clearing the channel, as the wind tends to blow out the fast ice, shortening the total distance of the channel.

Palmer fights icebergs, performs seismic work

By Chris Keary
NBP correspondent

Doing marine seismic work in Antarctic waters is always a challenge. This is mostly because of the ice. Either it keeps you from reaching your destination or it puts your equipment at risk. This week it did both for the *Nathaniel B. Palmer*.

We began the week sailing farther south along the Ross Ice Shelf, but our progress was hampered by – you guessed it – ice. Too much ice in the area where B-15 broke away from the shelf prevented researchers on our cruise from doing the continuous line of seismic surveying they'd hoped to do. Instead, we have gone to an area north of where C-19 calved off and will continue to work there until conditions improve and allow us to return to the first study area.

On this cruise we are using several different seismic guns, two seismic streamers and a magnetometer, all of which trail behind us like so many pieces of expensive spaghetti. The guns are relatively close to the boat, so they are protected from most of the ice by the ship's wake. The streamers and the magnetometer however, extend up to 1,200 meters, so there is always the fear that they will catch on a berg and get damaged or, worse, snap off and sink to the bottom, as happened to one of the magnetometers on the previous cruise.

The biggest worry at this point is damaging the new multi-channel streamer. The streamer is really just a long, smooth, rubber tube filled with microphones. The phones detect and record the sound waves emitted by the guns when they bounce off the ocean floor. Since the streamer is smooth and cylindrical there is not a lot of risk of it snagging on a piece of ice, but in order to keep it at the correct depth when it is in the water, it has been equipped with several devices called "birds." The birds, which look like large, winged bullets, are attached to the underside of the streamer at 300 meter intervals. The bird wings are controlled remotely from inside the ship, and are told when and how deep to dive. The wings also stick out quite a bit and are probably the biggest ice risk at this point in the cruise. So far we've been lucky with the equipment. With two and a half weeks left in the cruise, we're hoping to get just as lucky when it comes to getting back to our original study site.

Answer to p. 2 crossword

Heavy duty champ turns 50

By Mark Sabbatini
Sun staff

For 50 years MaryAnn and her family have done Antarctica's dirtiest work.

They've been lost beneath the sea ice, abandoned in remote camps for the winter and seen newcomers with less ability take over their jobs – except for the hard ones. Even now, the old codgers are still the toughest hombres on the block.

They may be only machines, but for many in the U.S. Antarctic Program a set of antique bulldozers – known by names such as Pam, Colleen and Big John – are like family. But their retirement is within sight and, as MaryAnn gets ready to celebrate her 50th birthday Sunday, the thought of losing them is crushing for many.

"I'd rather see an old D-8 here than Scott's Hut," said Russell Magsig, a mechanic who has been working in Antarctica for 15 of the past 19 years. "I could easily push (the hut) into the ocean and park it there."

The D-8 refers to a bulldozer not produced since 1963, known as the Caterpillar SD-8 LGP. Caterpillar continues producing updated D-8 models (plus D-6's, D-7's and others), but none have quite the same heavy-duty features users outside Antarctica simply don't need.

"They will pull a heavier, bigger load than anything else that we've got, across more difficult conditions without sinking in and without slipping," said Larry Cook, operations manager at McMurdo Station.

Above, a McMurdo Station worker, center, inspects two older D-8 Caterpillar bulldozers in front of the Chalet administration building Jan. 16 as mechanic Russell Magsig parks the machine nicknamed "Colleen." To the left is "MaryAnn," the oldest of the three remaining machines. The third machine, "Pam," will join the pair today to celebrate MaryAnn's 50th birthday. At right, Dave Tuepker and Beth Henry set up a display detailing the history of the tractors, which still outperform newer bulldozers at tasks such as plowing snow and hauling heavy loads.
Photos by Mark Sabbatini/The Antarctic Sun

Several decades of hard work and harsh experiences have taken their toll on the metal monsters, even with careful maintenance. Repairs are also getting harder, since many replacement parts are no longer made.

"The bottom line is these things aren't going to be around very long," Cook said. "We've reached a point where we can keep them going, but it takes a lot of effort."

Hence the well-deserved 50th birthday party, even if two of the three guests of honor will be a bit shy of the half-century mark. Colleen and Pam will join MaryAnn in front of the Chalet administrative headquarters at McMurdo at 10 a.m. today for a party honoring the machines for their service.

Dave Bresnahan, the station's National Science Foundation representative, will drive Pam to the event, bringing a cake and some other party nourishment with him. He's driven other bulldozers during his many years in the U.S. Antarctic Program, but this will be his first time behind the levers of an old-fashioned D-8.

"Those machines represent so much history, not only of the program but the people in the program," he said. "I consider it a real honor to do that."

An exhibit detailing the history of the bulldozers was displayed when MaryAnn and Colleen were parked in front of the Chalet last Wednesday. Cook said Mark Eisenger, a McMurdo crane operator, will perform a song titled "MaryAnn" he wrote about the machine. For the most part, the ceremony will be low-key.

> "I'd rather see an old D-8 here than Scott's Hut."
> - Russell Magsig, McMurdo mechanic

"Part of the ceremony will include starting them up so those who don't attend can also take part in the celebration," Cook said.

Over the years those loved ones have been through a lot of abuse. Part of the affection of those who drive and work on the tractors has been their ability to withstand it.

Big John, a class of '59 heavyweight, found himself partially submerged after falling through

See D-8 on page 8

D-8 From page 7

a crack at McMurdo's Hut Point during August of 1990, Cook said.

"It went in shallow enough water that it only went halfway in," he said.

Cook said they determined it was an eyesore and should be put out of sight.

"They decided to lower it by blasting the sea ice around it. In the blasting operation they pretty much blew up the machine, too."

All was not lost, however. Crews retrieved the machine and fitted the cabin on Colleen, a class of '59 tractor still at McMurdo, albeit in the repair shop.

MaryAnn, the oldest of the current fleet, was buried in snow after making a traverse to the South Pole. It was dug out and returned to work at McMurdo, although at the moment it is also undergoing repairs.

Pam is still used daily to clear snow and maintain the six-mile-long Williams Field road, service the ice runway, transport 5,000-gallon tanks of fuel to aircraft facilities and transport mobile buildings over the long road. Magsig said Pam has put in about 500 hours of work so far this year, less than the 1,000 she used to in her prime, but it's heavy-duty work other tractors can't manage.

"I know they're putting a lot more than that on the Challengers, but they're just flying up and down the runways," he said, referring to a newer model of tractor being used.

Photo courtesy of Larry Cook

An older model Challenger D-8 tractor clears snow near McMurdo Station. The bulldozers have a wider track than newer models, making them more suitable for such work.

The Caterpillar SD-8LGP – which stands for Stretch D-8 Low Ground Pressure – was built specifically for polar programs by Caterpillar, based in Peoria, Ill., during the 1950s.

"Most of the machines were purchased by the U.S. Navy and U.S. Army in the 1950s to 1960s era," wrote Fred Kaiser, Caterpillar's sales application engineer. "They were sent to Antarctica and Greenland to do the heavy towing work."

They were designed to carry heavy loads across snow, featuring a special cold-starting ability and a 54-inch wide track instead of the 36-inch track found on modern equipment. They also had a drawbar pull capacity on snow of 30,000 pounds, compared to about 24,000 for the D-7 model.

"The design was optimized by increasing the flotation of the machine by installing a much wider track than a standard D8, but retaining the weight so high drawbar pull could be exerted even in soft underfoot conditions as snow," Kaiser wrote.

All the extra heft meant some trade-offs, which is why the newer machines don't try to imitate them.

"Everybody would rather go 20 mph hauling nothing or hauling a little than 4 mph per hour hauling tons," Magsig said.

Caterpillar stopped producing the machines because military orders for them stopped, Kaiser wrote.

The design life of Caterpillar equipment is 10,000 to 15,000 hours without a major overhaul, he noted. He said overhauls typically extend the useful life of machines and "I think it would be safe to say the D8 LGP machines at McMurdo have exceeded their design life many times over."

Part of the reason the machines have lasted so long in Antarctica is driving on snow and ice put much less strain on the bulldozer's drivetrain than soil and rock, which the drivetrains are designed for, Kaiser added.

Beyond the numbers are the names – and the history they blazed.

A train of the tractors transported construction cargo from Little America V in Kainan Bay to Byrd Station during the 1956-57 summer for the International Geophysical Year. The D-8 was also used during the 1960-61 summer to pull the first U.S. surface traverse to reach the South Pole.

There are also tragic parts of Antarctic history associated with the D-8 models. Williams Field, the skiway for planes coming into McMurdo during the latter part of the austral summer, was named for Richard T. Williams, a Navy tractor driver who drowned in 1956 when the D-8 he was driving broke through the sea ice and sank too quickly for him to escape. Another tractor driver, Max Kiel, fell victim to a huge crevasse during the same period while driving 250 miles southeast of Little America.

Magsig said only one or two of the tractors were running when he first arrived in Antarctica nearly 20 years ago. He said at the time he never would have expected the machines to last this long, but within a few years it became apparent they were built to last and ideally suited for a "sledge-hammer mechanic" such as himself.

"We were just as simple as one another," he said.

But repairs aren't as simple anymore. Mechanics are forced to make their own replacement parts, borrow them from other tractors or find other ways to piece together the tractors when they malfunction. That takes up an increasing amount of time and money, making them less efficient to keep here, said Bobby Werner, supervisor of the vehicle maintenance facility at McMurdo.

It's possible the machines could be shipped off the Ice as early as next season, Werner said. He said he has mixed emotions about losing them, but noted they're probably older than 90 percent of the station's human population.

"I view them as nostalgic old machines that should be put in a museum somewhere," he said. "But it's time to modernize our fleet."

Model	Drawbar pull	Ground Pressure	Weight
SD-8LGP	94,000 lbs	4.3 psi	69,600 lbs.
D-7HLGP	48,955 lbs.	6.9 psi	62,563 lbs.
DV-87 Challenger	19,360 lbs.	4.6 psi	45,685 lbs.
Challenger 65	12,480 lbs.	5.2 psi	31,000 lbs.
Challenger 95	35,202 lbs.	5.3 psi	33,980 lbs.

Photographing history

Envisioning the past to photograph the present

Story by Melanie Conner, *Sun Staff*

When fine art photographer

Joan Myers looks through her viewfinder to take a photograph, she is also gazing at history as if looking through a portal into years past.

Myers took an interest in Antarctic history during her previous two tourist cruises to the Antarctic Peninsula and Southern Ocean, where she first conceived her artistic vision to photograph humanity, past and present, on the Antarctic landscape.

"I realized I was interested in human activity in the landscape or, in other words, what sort of history goes through the landscape," said Myers in reference to her first two visits to the Antarctic. "While everyone was shooting penguins, I was shooting huts. In fact, if I had it to do over again, I would have shot more penguins."

Myers got another chance to do it again. During the past four months she has photographed everything from spawning sea urchins and balloon launches to workers in the dining hall and penguins near McMurdo Station. Each time she looks for the human element that can speak to the passing of time and humanity's experiences and adjustments to being able to live and work on the hostile continent.

"I've been photographing people much more than I normally do. People are really part of the historical process here. The science support staff is why the science happens and they are participating in science," said Myers. "So many people here are contributing and it goes unrecorded."

Accustomed to photographing portraits and still life in previous projects, Myers incorporates people into her scenes for visual perspective in Antarctica.

"I'm always looking for what is in the landscape. Here I've found that I really like putting people in the photos." she said. "I've had to shift gears and pay attention to the human element."

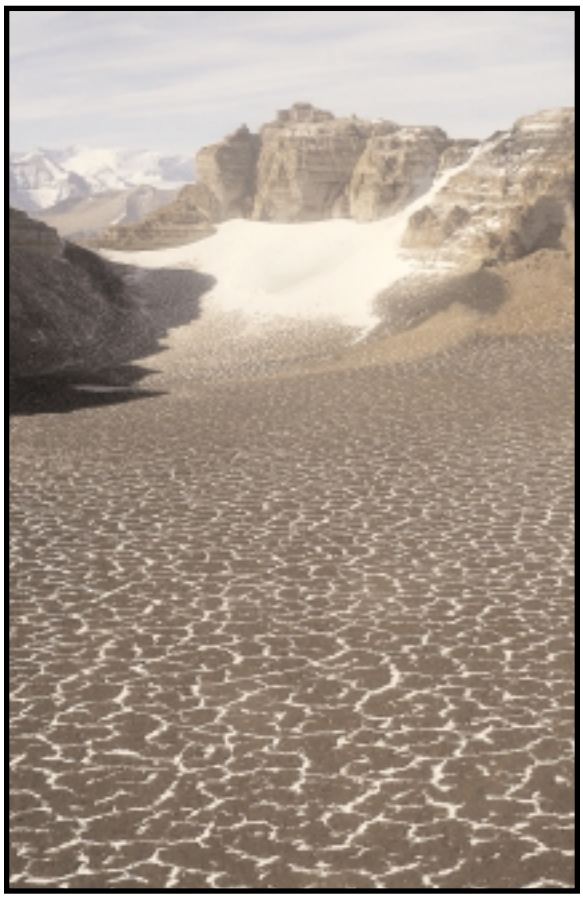
Before Myers could come to Antarctica to work on her conceived project, she first had to obtain an invitation from the National Science Foundation.

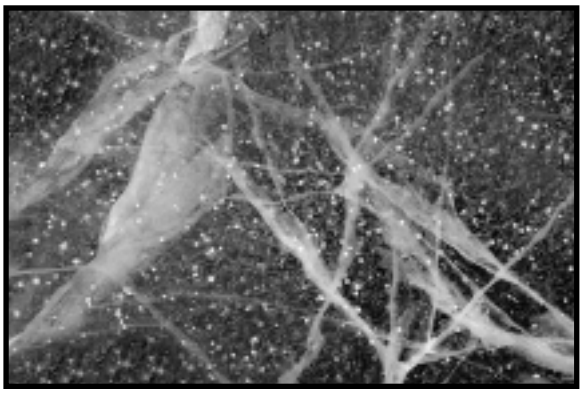
Aware of the notable photographers preceding her, Myers knew she needed to distinguish herself. She presented the NSF with the possibility of a book that would chronicle human habitation in the extremely cold conditions of the Antarctic, in collaboration with a writer from the *New York Times,* Sandra Blakeslee. She also showed the NSF handmade prints, using a process called palladium-platinum processing. It's a craft with origins dating back to the beginning of photography in the early 1800s and has been used by many of history's top photographers such as Irving Penn and Alfred Stieglitz.

Museums and art collectors value palladium-platinum prints because of their archival stability and the fine quality produced by the handmade craftsmanship. Printed from a black and white negative, the images have a slightly "warm" cast and generally they hold more detail in dark and light values than in conventional silver prints.

To make a print, Myers mixes the platinum-palladium emulsion, brushes it onto the paper, places the negative overtop and exposes the image under UV light for about three to five minutes. Unable to enlarge the photo in the

See Myers on page 10





Top: This view of Beacon Valley in the Dry Valleys reminded fine art photographer Joan Myers of the Four Corners area of New Mexico, her home state. Above: Myers took this photograph of lake ice in the Dry Valleys in November. "It was amazing," said Myers. "The ice is over a million years old."

Photographing history

Top: A Twin Otter aircraft flies above the Onset D field camp after dropping off supplies for scientists and camp workers."This is an example of how one lives in a deep-field camp and the emptiness of the ice sheet," said Myers. Middle: A photograph of Mt. Newell shows a human presence on the Ice, but away from the major science stations. Above: Grantee Nelia Dunbar pokes her head into an ice cave on Mt. Erebus, one of Myers favorite photographic places.

> "I realized I was interested in human activity in the landscape."
>
> - Joan Myers

Myers From page 9

printing process, Myers normally shoots medium format film and enlarges the negative to the size of the final print about 20 inches wide. At the time she is taking the photographs, she is looking ahead and seeing the final printed results, said Myers.

Although Myers enjoys working with medium format cameras that produce large, high-definition negatives for her prints, she has tailored her photography methods somewhat to meet her project goals while working within a prescribed set of circumstances of cold, dry and windy conditions. She decided to work primarily in 35mm, high-resolution digital photography.

While photographing during her last of two previous trips to the Antarctic, she learned that 35mm cameras were easier to work with under harsh weather conditions than larger, more cumbersome medium format cameras.

Smaller cameras allow Myers to carry less camera equipment into the field and better protect her gear from cold weather and wind. Because of technological advances in digital imaging, she is able to photograph at a resolution capable of reproducing large enough negatives for palladium-platinum prints.

"This is really not my medium. I really don't have much experience with 35 mm," she said. "With 120 film, you have to change the film every 10 pictures. That is impossible here. I love to shoot four by five, but I just can't do it here. It is too difficult to change film every few frames."

While Myers found the most practical camera system for her needs, she admitted to having less luck in keeping her extremities warm.

"I just can't find a good system for keeping my hands warm for shooting," said Myers, who lives in Santa Fe, N.M. "I've tried several combinations, but nothing really works."

"My first photo shoot on the Ice was at snow

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Photographing history

"Erebus was one of the most impressive places I went," said Myers. "The volcano sends up heat and steam to form ice caves and towers, making it a wonderful mixture of fire and ice." In this photograph, Myers stood near the volcano's rim to photograph down into the crater.

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school and we got a terrible blizzard and I got frost nip on the ends of my fingers," said Myers about the early-summer blizzard in October, shortly after her arrival at McMurdo Station. "My fingers stopped feeling cold and just felt wooden."

She learned quickly everything functions differently in cold weather from her fingertips to her cameras, to making shooting more time consuming and arduous than it normally would be.

"Most problems get started at about 20 below or colder," said Myers. She said the challenges in changing lenses, filters, switching cameras to shoot medium format film or keeping track of pens and notebooks is more difficult when trying to prevent equipment from freezing and goggles from fogging.

"I didn't think I would need an assistant, but it is very difficult to do everything yourself. To take notes while you're photographing and trying to stay warm is very difficult," she said. "I often forget to get people's names, among other things."

Working in places ranging from deep-field camps to the carpenter's shop, Myers has kept a busy schedule of photographing, writing notes and editing her images.

"If I spend a day out shooting, I will usually spend the next two days in the office editing," said Myers, who also updates her online journal weekly.

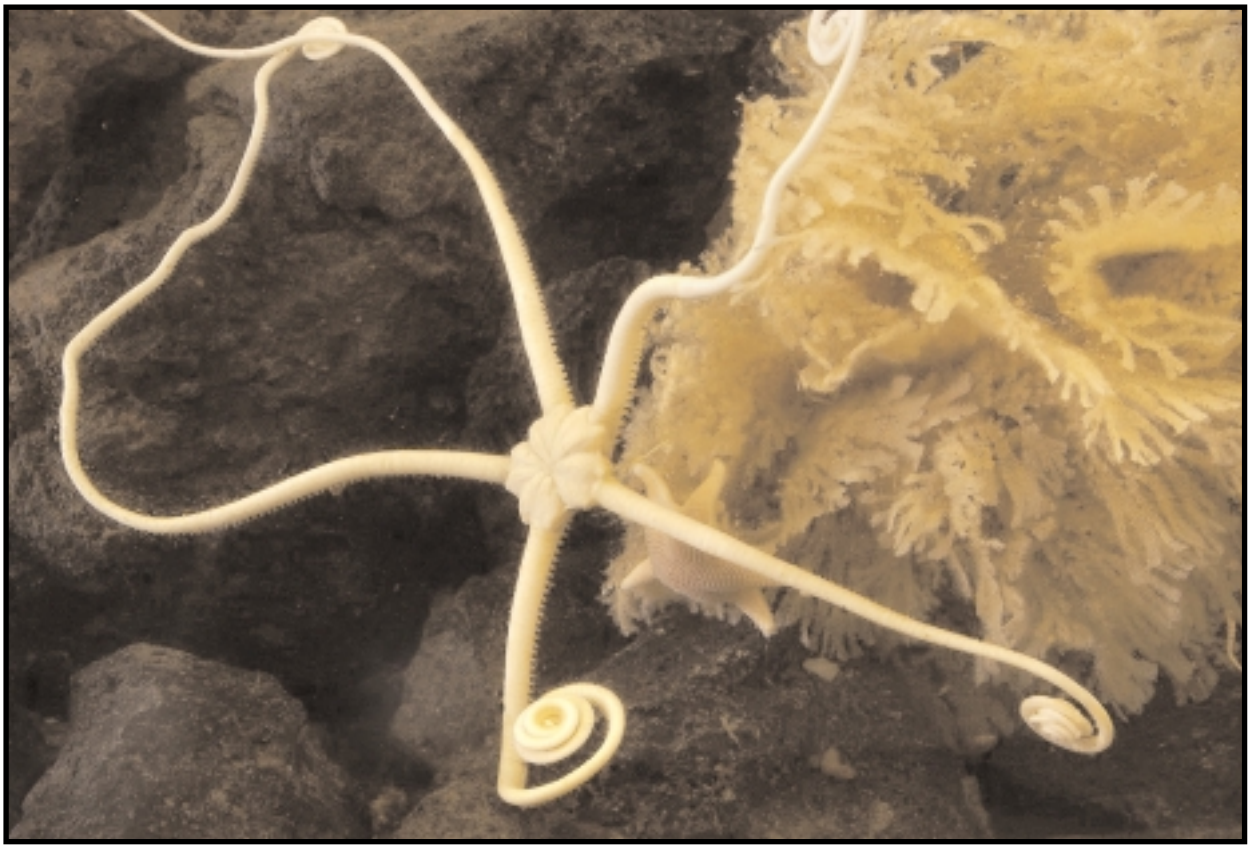
Her rest will come soon when she leaves Antarctica to meet her husband in New Zealand later this week. She will have 12 days of relaxation before returning home to edit and print photos and begin the production of her book.

Myers has a lot of work to do before her project is in its final form. As for now, she remains enthused about her photographic opportunities over the next few days as she thinks about her own adaptations to the cold environment and personal history in Antarctica.

"I love it here. This is the world's greatest community. No weapons, no fighting, it's safe and people are interesting," said Myers. "I can have an interesting conversation with a scientist at one meal and a janitor at the next. You just don't get that anywhere else. I'll really miss McMurdo."

See Cold weather photo tips on page 12

Photographing history



"I've never photographed this kind of thing before," said Myers. Photographing this sea spider was one of her first attempts at close-up science photography. For this photograph, Myers collected black rocks from around McMurdo Station rocks, cleaned out a tank and ran a hose into the tank with streaming salt water to keep the water clear and cold for the critters. "It took days to photograph this," she said. "The critter didn't move very fast. That was helpful," she said.

Cold weather photo hints

Here are some tips that might help you when photographing in Antarctica or other cold climates

• **Keep equipment warm.** Always tuck camera bodies, extra batteries, film, compact flash cards and other sensitive pieces in an inside pocket as close to your body as possible. While cumbersome, this will keep your equipment functioning longer and help prevent damage.

• **Take the extra step if needed.** In extremely low temperatures such as the South Pole take only the essential lenses and equipment outside with you, keeping your camera bag inside a warm building. Go inside to change lenses or film. This will allow for some of your camera equipment to stay warm, plus you will be able to take off your gloves to perform these functions.

• **Cold hands.** Try wearing hand warmers in-between your glove liners and gloves. It may sometimes be necessary to take your gloves off, so be careful not to let the hand warmers fall out. Try to avoid removing glove liners, as cold metal cameras can cause painful cold weather injuries. Everyone has a different method; talk to friends and share ideas to find a solution that works for you.

• **Film speed.** A film speed or digital setting of 400 ISO for most outside situations allows for maximum depth of field and for a high-quality image. However, in bright sunlight, with snow and ice reflecting light, using 200 ISO film will allow for a wider aperture if this is the desired affect.

• **Exposure settings.** The same way different film types will render warm or cool tones, digital cameras also vary on exposures. Some cameras will be manufactured to underexposed images slightly, while others may overexpose. Experiment with the exposure compensation mode to determine a baseline that works for you. Don't assume every camera is the same. Bracket your exposures.

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Photographing history

tips From page 12

• **Bright light.** When photographing against a white surface, normally the subject will be underexposed when the pictures come back from the lab. You will need to "open up" about a stop. Be careful not to overcompensate, as the snow will reflect a substantial amount of light onto the photo subject and all detail in the snow, pressure ridges or sastrugi will be lost. Try experimenting with fill flash.

• **Flat light.** Diffused sunlight will scatter and bounce around, turning everything blue on film. Try using a UV warming filter to reduce the blue cast and allow whites to remain white and flesh tones to look accurate.

• **Tripods.** Use a tripod. Even on the sunniest days, a small aperture for maximum depth-of-field, combined with a polarizing filter, can force you to shoot at slow shutter speeds that could record camera shake. "Even 1/1000 of a second can show shake if the print is produced large enough," says Joan Myers.

• **Reducing condensation.** Condensation can allow moisture to get inside your camera or lenses and destroy the electronics. If going from the cold into a moist environment like the greenhouse or the dining hall at the South Pole, place your camera inside a plastic bag to keep it dry until it begins to warm up.

• **Reducing dust.** Try to minimize lens changing. The instant a lens is removed dust is introduced into the system. This is especially true of photographing near McMurdo Station, with ultra-fine, glass-like volcanic dust from Mt. Erebus, blowing around in the wind, that is capable of destroying equipment. Zooms allow you to work within a range, allowing for more composition options without changing lenses. When changing a lens, keep the body facing downward, to prevent dust from falling into the body. Finally, static electricity will increase dust. Stay grounded on metal when changing lenses and don't rub your feet on the carpet first.

Photo by Melanie Conner/Antarctic Sun

Joan Myers at McMurdo Station.

Top: An Adelie penguin cares for its chick at Beaufort Island. "It's such a hostile continent, that you just want to photograph anything alive like diatoms and fish, but especially 'cute' life," said Myers. Middle: A seal pup cuddles with its mother near Razorback Island. "I photographed next to the researchers and I had to move very slowly and get around the animals," said Myers. Above: Adelie penguins at Beaufort Island, a place described by Myers as "magical, wild and beautiful."

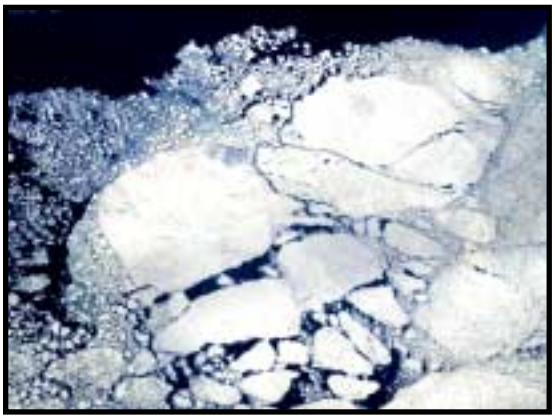

Photo by Melanie Conner/The Antarctic Sun

Photo by Joan Myers/Special to The Antarctic Sun

The icebreaker Polar Sea, right, stops to let the crew celebrate New Year's on the sea ice as it broke the original channel. Above, some of the flows of pack ice held in by iceberg C19.

Healy

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"It's the longest channel we've seen in recent years," said NSF Representative Dave Bresnahan, who has many years experience in the Antarctic.

It was also one of the hardest to create. From the moment the *Polar Sea* hit the edge of the fast ice it's had to grind through unforgiving ice. At the edge, where the ice is thinnest, it was 4 feet (1.2 meters), thicker than usual.

"Basically we've been going through some pretty tough ice conditions," said lieutenant junior grade Lance Tinstman aboard the *Polar Sea*. "This is some of the thickest fast ice that anyone's seen."

The *Polar Sea* followed last year's channel through the fast ice, which shows up as grooves in the snow. While that's been the path of least resistance, it's still been difficult. The ice reached 12 to 13 feet (~4 m) thick, with a couple feet of snow on top softening the breakers blows "like a hammer hitting a pillow," Tinstman said.

For a while the *Polar Sea* was advancing only 100 to 300 yards (90-270m) an hour, with a combination of its three engines and turbines running. One day the breaker moved less than a mile in 15 hours. While cutting the worst ice, the breaker burned 4,000 gallons (15,000 liters) of fuel an hour. It's now refueled, taking on 620,000 gallons (2.3 mil. liters) last weekend.

The broken starboard propeller and hub, 46-tons together, cannot be fixed until the *Polar Sea* returns to Seattle, Brown said.

"This is a shipyard drydock repair only," Brown said. "There are only two to three specialized hubs of this nature in existence."

The limping icebreaker will continue working to widen the channel and turning basin, and clear out some of the ice with the remaining center and port-side propellers. Marble Point will probably be refueled by land traverse, instead of sending the *Polar Sea* and more tasks will be left for the back-up icebreaker, the *Healy*.

"We can anticipate the *Healy* will be more involved with channel operations than she would have been before," Brown said.

The Coast Guard recommended sending Healy to assist in icebreaking operations, a recommendation with which NSF concurred. The final decision was made Jan. 3.

The *Healy* left Seattle Jan. 10 and is now heading south past Hawaii. It's a new direction for the two-year-old *Healy*, which was designed with Arctic research in mind and has made three NSF-sponsored missions to the Arctic, including reaching the North Pole Sept. 6, 2001.

"After this trip we'll have been to both extremes," said lieutenant junior grade Dan Everette aboard the *Healy*.

The *Healy* is expected to arrive at the McMurdo Sound ice edge in early February and spend a month escorting other vessels through the ice. The Coast Guard assured the director of the Office of Polar Programs that the *Healy* will return north in time to resume its regular missions to the Arctic in June.

"It's definitely needed," Tinstman said. "It's going to be well appreciated."

The new cargo vessel, the *American Tern*, left Port Hueneme, Calif., Jan. 5 and is expected at the ice edge by the beginning of February. The fuel tanker will be about a week behind. The annual visit by the cargo ship and tanker provides the food, fuel and materials needed to run the U.S. research stations and field camps on the Antarctic continent for the next year. They are not constructed to go through the heavy pack ice and narrow fast ice channels alone.

"The freighter and the tanker are ice-strengthened, but they are not icebreakers," Ocean Projects Manager Sutherland said. "If they have an icebreaker immediately in front of them – they have to stay almost bow to stern – the icebreaker is essentially shedding all the ice."

It's the second year difficult sea ice conditions in the Ross Sea have led the Coast Guard to respond by sending a second breaker. Usually a single Coast Guard icebreaker, the *Polar Sea* or *Polar Star*, cuts a channel through the fast ice for the supply ships. In good years, the first cut from the ice edge to McMurdo has been made in a day, Brown said.

The last few years have not been good. Last season it took the *Polar Star* nine days to cut the channel, even with the *Polar Sea* coming down to help out. This month the *Polar Sea* exceeded that, taking 11 days to get from the ice edge to McMurdo. The last time breaking ice took that long was 1983, when the breaker spent a dozen days getting to McMurdo.

McMurdo isn't the only station recently plagued with difficult sea ice. In the southern Weddell Sea last year the ice was the worst in at least 50 years and the annual relief ship wasn't able to reach Halley Station for the first time since it was established in 1956, according to Steve Harangozo of the British Antarctic Survey. Instead, the relief ship had to stop 180 miles (300 km) from the station and aircraft shuttled the cargo and passengers back and forth.

The problems in the Weddell Sea were caused by temporary changes in the usual wind and ice flow patterns, which pushed the pack ice up against the southern Weddell Sea coast instead of out to sea, as discussed in a paper by Harangozo and J.

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Photo by Keoni Galletes/USCG

A five-ton blades is missing from the 16-foot starboard propeller, above, on the Polar Sea*. The entire propeller weighs 46 tons.*

Healy

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Turner in *Geophysical Research Letters* last year.

"Basically there were very strong, sustained northerly winds that were pushing the ice down toward the southern Weddell Sea over three months," Harangozo said.

This year the sea ice in the Weddell Sea is back to normal and the ship made it in without problems, Harangozo said. He thinks a similar temporary change in the atmosphere and wind patterns may be keeping the sea ice in the southern Ross Sea from opening up. The Amundsen Sea Low, which usually produces southerly winds to blow out the Ross sea ice, is much weaker than normal this year. Instead, the low pressure systems have been in or northwest of the Ross Sea, creating northerly winds, Harangozo said.

"These northerly winds melt the ice at the ice edge, but they also compress and push the remaining ice south, so that the polynya (opening in the sea ice) is unable to develop," Harangozo said. "This compression could produce the thick, and presumably high concentration, sea ice reported en route to McMurdo."

The sea ice has been growing in the Ross Sea for a while, part of a trend of slightly increasing ice around Antarctica as a whole. Based on satellite observations, the overall Antarctic sea ice increased by about 11,000 square kilometers from 1979 to 1998, according to a paper by H.J. Zwally in the Journal of Geophysical Research. While the expanding sea ice is a seasonal phenomenon around most of the continent, the Ross Sea is the one area where the sea ice was pushing farther out year round. Though this is the opposite trend from what's been seen in the Arctic, where sea ice has been diminishing, it is consistent with predictions of global warming in which increased snow on the Southern Ocean would insulate the sea ice, according to Zwally.

"That has not been observed directly, that is in the coupled ocean and atmosphere model

"The Ross Sea had one of the largest increasing trends of sea ice during this 20-year time period," Zwally said, increasing 12 percent in the summer and 4 percent in the winter.

Last year the fast ice was looking equally troublesome in McMurdo Sound until a late December storm blew out some of the ice. That storm was unusual compared to weather patterns in preceding years, said University of Wisconsin meteorologist Matt Lazzara, currently doing research in McMurdo. So far the weather around McMurdo Sound this year has been more normal, Lazzarra said.

The greatest effect on the McMurdo fast ice comes from large icebergs blocking the usual patterns of wind, current and sea ice, said Judy Shaffier, who studies and predicts Antarctic sea ice for the National Ice Center.

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Inside the Healy

Built for Arctic science

The newest icebreaker in the Coast Guard's fleet was designed with polar science in mind.

The two-year-old *Healy* has more lab space on board than the 20-year-old *Polar Star* and *Polar Sea*, but less horsepower. Designed with input from the University National Oceanographic Laboratory System, the *Healy* has seven laboratories and more than 5,000 square feet of laboratory and science support rooms.

Though it's coming to Antarctica to help supply vessels reach McMurdo this year, the *Healy*'s usual mission is to take scientists into the Arctic Ocean. Last year it carried out the National Science Foundation-supported Western Shelf Basins Interactions project, which is looking for early indicators of climate change in the Arctic. Researchers on a previous *Healy* cruise found evidence that the Arctic's Gakkel Ridge, the world's slowest spreading mid-ocean ridge, may be very volcanically active.

Usually the more powerful *Polar Star* and *Polar Sea* take turns coming to Antarctica, and last year both breakers came down together. This year the *Star* is in dry dock having regular maintenance done, so it wasn't available to go south. As a contingency plan, the *Healy* crew was notified in mid-December that they might be sent to Antarctica to back up the *Polar Sea* and they were ready when the decision was made in January, said LTJG Dan Everette aboard the *Healy*.

Until now, the farthest south the *Healy* has been was the Panama Canal. Though the breaker hasn't been to the Antarctic, a number of the crewmembers have, including the captain and executive officer.

"We're looking forward to seeing what the ship can actually do in the ice," Everette said.

The *Healy* has less than half the horsepower of the Polar class icebreakers and is capable of breaking up to 4.5 feet of ice at a speed of 3 knots, or 8 feet backing and ramming.

"It's a less capable icebreaker than the two other icebreakers, the *Polar Sea* and the *Polar Star*, which are the most powerful conventional icebreakers, non-nuclear icebreakers, in the world," said Dirk Kristensen, a designer of ice capable vessels for the Glosten Associates in Seattle.

Both the Coast Guard and NSF are confident *Healy* can do its job in the Antarctic. In its last trip to the Arctic the *Healy* forced its way through 12- to 13-foot ice.

"It isn't just driving from point A to point B, there are different techniques you use," Everette said.

Both the *Healy* and the *Polar Class* ships have similar compromises in their hull designs, Kristensen said. The ideal icebreaking hull has a broad, flat bow. But to cross open water, as the breakers do between their homeport in Seattle and missions in the Arctic and Antarctic, requires a deeper, more angled hull.

The *Polar Sea* and *Polar Star* also tend to have frequent mechanical problems because their propellers stick out from the sides. The way the hull is shaped, chunks of ice broken at the bow have a tendency to slide along the hull and hit the propellers, Kristensen said.

On Thursday one of the *Polar Sea*'s propellers broke and the blade fell to the ocean floor. In 1994 the *Polar Sea* lost a propeller blade at the North Pole.

The *Healy* has fewer propeller problems, Everette said, because the two propeller shafts are "nestled underneath the boat."

"They're pretty well protected from ice coming down along the hull," he said.

Photos by Mark Sabbatini/The Antarctic Sun

Michael Holstine, above left, and Robert Moore wait outside a research hut that provides power to the Very Low Frequency antenna, about one mile away on the snow road in the background. At right, they examine the VLF antenna with Vladimir Papitashvili, right, that assists in collecting data about the upper atmosphere.

Photo by Mark Sabbatini/The Antarctic Sun

VLF From page 1

and Radioscience Laboratory at Stanford University.

Airplanes typically fly up to six miles (10km) high, the ozone is measured with balloons at 19 miles (30km) and satellites can't go below 155 miles (250km) because the air gets too dense and causes too much friction for them to orbit around the planet.

The only way to measure the mesosphere and lower thermosphere is by passing very low frequency electromagnetic waves through it, Inan said. Such waves are generated naturally by events such as lightning strikes, but the transmitter at the South Pole – where there are no thunderstorms – allows for more controlled observations.

The signals produced by the South Pole VLF beacon transmitter will be received at Palmer Station and coastal Antarctic stations of other countries, providing a scan of the ionospheric regions it passes through. This season's assembly and construction of the transmitter marked the beginning of the second year of research on the three-year project, funded by a grant from the National Science Foundation.

Though it's not well understood, the mesosphere and lower ionosphere do have a strong effect on things we all pay attention to and at some level depend on. High-speed electrons that populate the Earth's radiation belts can damage spacecraft and flip satellites.

"The weather in space is very, very important for our technological age now, because we have so much of our assets in space," Inan said.

The highest energy electrons can also penetrate as low as 25 miles (40km) above the Earth, where they can "wreak havoc in the atmosphere, ionizing chemical species, creating x-rays and perhaps influencing the chemistry that produces ozone," he noted in a summary of the project.

Events such as solar flare-ups and geomagnetic disturbances trigger the "particle precipitation," said Robert Moore, a research assistant working on the project for his dissertation.

"There are a number of different theories saying 'This is why this type of event happens,'" he said. "But we don't have any data to back it up."

Inan, who is also conducting VLF research in the U.S. and Canada, said the new South Pole transmitter should help scientists better understand and someday

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"The icebergs seems to be affecting the typical wind and current flow," Shaffier said. "With (icebergs) C16 and B15 grounded where they're at, that has a lot of effect down there."

Icebergs C16 and the much longer B15 took up residence off the north end of Ross Island almost three years ago, creating a wall of ice 100 feet high and 900 feet deep that is diverting the usual clockwise current that flows westward along the front of the Ross Ice Shelf from scooping into McMurdo Sound, bringing in warmer water to melt the ice and carrying broken ice north.

The situation worsened this year when another large iceberg, C19, settled in somewhat north and perpendicular to B15. C19 is acting like an ice dam, trapping miles of heavy pack ice behind it.

"I'm not surprised that they're going in for some help," Shaffier said. "We kind of figured C19 would wreak a little havoc down there."

Besides causing problems for the icebreaker, the icepack kept researchers on the *Nathaniel B. Palmer* from mapping sections of the continental slope, as they'd planned.

How long it stays and how much havoc it will wreak are unknown. For a while C19 seemed to be hung up on two submarine banks, about 250 to 270 meters deep at their shallowest points, said Stan Jacobs, Lamont oceanographer. C19 is bouncing a little in place and recently swung its western end a little farther north, said Kelly Brunt, a geographic information systems analyst at McMurdo Station who tracks the bergs. If it keeps swinging it could re-orient itself in a north-south position and be carried away by the currents. But there's also a chance that the movement has jammed the eastern end of the iceberg into a rise in the ocean floor called the Pennell Bank.

"It doesn't take much to ground it, slow it down, get it stuck, but it also doesn't take much to get it going again," said Andy Bliss, a graduate student at the University of California who has been studying the movements of Ross Sea icebergs with University of Chicago researcher Doug MacAyeal.

If C19 stays it will continue to hold in the pack ice, which will freeze in for another season, Shaffier said. That would make the ice blocking the way to McMurdo even worse next year, said MacAyeal, a professor of geophysical sciences.

"I hope it goes away because if it doesn't you'll have an even more intense sea ice anomaly next year," MacAyeal said.

VLF From page 16

predict this "space weather."

Data from the antenna can also be used to study more traditional weather effects, Inan wrote in a summary of his project. He cited a past example of intense precipitation over South America due to the South Atlantic Anomaly, noting that the positioning of the antenna and a receiver at Palmer Station provides unique positioning to study the phenomena.

The beacon "will measure the temporal variations and also assess the local time distribution via measurements on a set of distributed paths," he noted.

The transmitter antenna needs to be very long in order to transmit a low enough frequency that the wavelength will bounce off the mesosphere and lower ionosphere. The frequency needed to be in the 10 to 25 kilohertz range. In comparison, an AM station broadcasts at 800 kilohertz. Software written by Moore allows the VLF beacon to transmit at various frequencies, with or without modulation, and to perform diagnostic measurements.

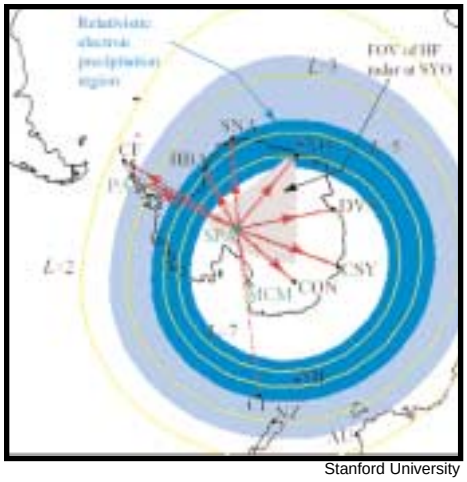
A shorter antenna, of say 328 feet (100m), could easily broadcast at a much higher frequency of three megahertz. But to go lower requires longer antennas. Inan needed an antenna at least four miles (7km) long.

There aren't many places to put such a long antenna, especially since it needed to be elevated off the ground, for the same reason a household television antenna works better when put on the roof instead of the ground.

"South Pole is an absolutely fantastic platform for this because of the snow," Inan said.

Photo by Mark Sabbatini/The Antarctic Sun

Robert Moore, a research assistant, and Vladimir Papitashvili discuss the connection of a power cord to the VLF beacon.



Stanford University

Transmissions from the VLF beacon at the South Pole will be sent to coastal Antarctic stations from several nations.

Nearly two miles (3km) of snow and ice below the South Pole act to insulate and lift the antenna off the ground. Additionally, the antenna line is 16 feet (5m) above the surface of the snow, on 125 poles set 250 feet (78m) apart running parallel to the South Pole runway.

The poles are bolted to sheets of plywood buried about three to four feet beneath the surface, held secure from the elements by snow that freezes solid within a day, Moore said. He said researchers expect little trouble with the beacon, despite the miles of poles and lines exposed to the polar elements.

"The only real maintenance on this antenna will be trying to reverse the effects of snow drift," he said, noting the poles can be raised as needed.

The antenna should be better suited for long-term research – should the project be extended – than a similar transmitter used at Siple Station between 1972 and 1988, Moore said. The Siple antenna had to be dug up and replanted every year since the snow accumulation there was about three feet per year.

Finished in December, the South Pole antenna started transmitting this month. It operates for one minute out of every 15 minutes, using 5 to 6 kilowatts of power, then recharging its batteries for 14 minutes via a 1.2-mile (2km) cable linking it to a portable science research building where data is recorded.

"We don't want to use too much power," Inan said. "During the one minute, we transmit at high power from the batteries."

The transmitter's placement at the South Pole will be advantageous for other reasons as well. The South Pole is situated so that a signal from there will pass through one of the most disturbed areas of the outer radiation belt and then be easily picked up by existing receivers at Palmer Station, Inan said.

"The South Pole and Palmer geometricy works beautifully for this experiment," Inan said. "It's really unique."

Receiving the signal doesn't require a large antenna – the one at Palmer is 30 feet (9m) tall – but it must be away from electrical interference by computers, microwaves, generators and other electronics.

"Our antenna is extremely sensitive. You could bring your digital watch up to it and it would receive it," Inan said.

The signal will also be picked up at the Automatic Geophysical Observatories (AGOs) on the plateau and at receivers being built at stations belonging to other countries in all directions across the continent. Among the bases are McMurdo Station, Britain's Halley Bay, Brazil's Commandante Ferraz, South Africa's Sanae, Japan's Syowa and the Italian/French Concordia station.

"This is an international program where basically other countries will receive the signal. As they do so they will measure [the mesosphere and lower thermosphere above] other parts of the continent," Inan said.

Profile

Seal scientist picks up trout fishing

By Kristan Hutchison/*Sun staff*

After 30 years studying Weddell seals in McMurdo Sound, Don Siniff plans to focus his attention on trout.

He'll be catching the fish, rather than counting them, from the stream running through the Wisconsin farm he and his wife fixed up.

"I doubt if you'll see me in McMurdo again," said Siniff, who is retiring from the University of Minnesota at the end of the academic year.

From that land-locked university, Siniff has taught a generation of marine mammal scientists, sometimes jokingly called the "Minnesota mafia."

"Don has probably trained close to half the marine mammal scientists working in North America," said Bob Garrott, who worked with Siniff as a PhD student and is now taking over his population study of Weddell seals in the Antarctic.

Siniff remains a co-investigator on what is now a National Science Foundation grant to Garrott and Jay Rotella, both scientists in the ecology department at Montana State University in Bozeman. In Siniff's final season on the Ice, he and Garrott went into the field together. They would rise by 6 a.m., go to the equipment hut and brew coffee while everyone else slept. Don sat in a beat-up easy chair by the stove while Garrott perched on a desk and they talked for hours about Antarctic science and the seals and doing work on the Ice.

"It was a wonderful thing after all those years," Garrott said. "He's quite the mentor."

Siniff hadn't expected to spend so much of his career in Antarctica. Having finished his PhD at the University of Minnesota, he expected he'd go back to Alaska where he'd recently finished a census of caribou and brown bear. Then he heard the National Science Foundation wanted to count the seals in Antarctica. Having done some tagging of stellar sea lions in Alaska, Siniff put in a proposal to do the Antarctic work.

He was 32 when he took his first trip south in 1968, looking for crabeater and leopard seals from aboard the icebreaker *Glacier*. The next year he came to McMurdo to work with Weddells. He soon realized that it would be possible to do a population study there.

"The other species haven't really lended themselves to the situation you have in McMurdo, where they are long-lived and they return to the same location," Siniff said.

The Weddells are easy to approach and handle, unlike other large mammals Siniff studied. He once ended up chasing an injured leopard seal around an ice floe. Leopard seals are about 7-feet-long, 1,000 lbs, with "an impressive set of teeth," Siniff said.

> "Don has probably trained close to half the marine mammal scientists working in North America."
>
> Bob Garrott, seal researcher

"It was a little dicey, but at the time, when you're young and foolish, you don't really realize you shouldn't be doing this," Siniff said.

He was lucky. In all his years studying bears in Alaska, wild horses in Nevada and leopard seals in Antarctica he was never injured.

Siniff wore out a lot of red parkas though, staining them with seal fat or oil from the stove and ripping them as he worked. In his early years of Antarctic research the scientists had to set up and take care of their own camps. Now Raytheon Polar Services has people to set up and manage the field camps, but it used to be that Siniff would arrive in McMurdo to find a fish hut waiting in front of the station for him to hook up and tow into position. The work was cold, vigorous and satisfying.

"It's my kind of science," Siniff said. "I'm a disaster in the laboratory. I was a farm kid from Ohio and somehow that fit the type of work that I could do."

Funded with a series of three-year grants from the National Science Foundation, Siniff's study of the Weddell seal population has grown into a unique and consistent set of data going back to 1970. Weddell seals live only 28 to 30 years, so all the seals in the sound have grown up in the study, and the ages of about 60 percent of them are known.

"There can't be more than five long-term studies of this caliber in the entire world, if there's that many," Garrott said.

The Weddell seal data could become even more valuable in coming years, as the pressure to fish around Antarctica increases, Garrott said. At the top of the food chain, Weddell seals may help researchers track changes in some of the harder to study species below them.

Siniff's contributions to science go far beyond the results of his research or even the many students he's mentored. Siniff has served on committees and panels, including several within the Scientific Committee on Antarctic Research and been on recovery teams for sea otters and sea lions.

"That's the one incredible value of the Antarctic program, I might add, is the international aspect of dealing with your colleagues around the world," Siniff said.

Siniff listens more than he talks, accommodating others and setting an example of respectful dialogue. When he does speak out, in his quiet Midwestern way, people listen.

"I can't overemphasize how much he is respected," Garrott said. "There's lots of jealousy and cliqué groups in science and Don just transcends all of those. He's well respected by everybody he meets."

Siniff plans to stay involved in many of the scientific committees, but he's also looking forward to nonscientific pursuits, like trout fishing and visits from his grandkids.

"I don't have any great plans, I hope to keep involved a little bit with Antarctic things," Siniff said. But if he comes to Antarctica again, Siniff said it might be on a cruise ship instead of a research vessel.