The Antarctic Sun

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October 31, 2004

Far from the edge

McMurdo blocked by 240 km of sea ice

By Kristan Hutchison
Sun staff

Exceptionally extensive sea ice has become the norm the past few years, and this year brings more of the same.

The sea is frozen all the way to the Drygalski Ice Tongue, about 240km from McMurdo Station. From there, the ice edge curves southeast toward Franklin and Beaufort Islands, where a pile-up of icebergs blocks the movement of ice, wind and water.

"I'm not the ice god, but based on the last four years of looking at those things, we are worried," said Coast Guard spokesperson LCDR. April Brown.

The National Ice Center, the federal entity responsible for monitoring sea ice in the path of U.S. ships, predicts there still will be between 180km and 220km of ice when the breaker arrives in late December to cut a channel for the fuel tanker and resupply vessel. The ice could cause a later-than-normal channel opening and the fuel tanker and resupply vessels probably will require an icebreaker escort until about Jan. 20.

Back in what now seems like the good old days, winter storms used to blow out the sea ice, leaving open water in front of McMurdo Station until July. New sea ice would form until mid-October, but by the time the breakers arrived in December there would be an average of 25km to 30km to cut through.

McMurdo Sound hasn't completely broken out since 1998 and it has become almost normal for the channel to open late, said Brown. The sea ice already was considered excessive the past three years, when it ranged from 90km to 110km in October.

"That had us petrified, and now we've got it out 100 miles," said Al Sutherland, ocean projects manager for the

See Ice on page 9

Photo by Emily Stone / *The Antarctic Sun*

General assistant Heidi Hausman uses a power drill to determine the depth of the sea ice during training Oct. 25. The sea ice extends farther than usual this year.

Scientists try to catch a wave

By Brien Barnett
Sun staff

The notorious waves of the Drake Passage may serve as a model to help researchers learn more about how the air and ocean interact and could give clues to climate change.

> "There's one place people go, come hell or high water, and that's across the Drake Passage."
>
> *— Steve Emerson*

Professor Steven Emerson, of the University of Washington's School of Oceanography, targeted the Drake Passage because it's where the Southern Ocean is forced between Antarctica and South America and sometimes turns into a churning froth. To Emerson it seems the perfect spot to test the waters for a new measurement of how much carbon dioxide oceans absorb. Carbon dioxide is a key component of the atmosphere and also a player in climate change.

To get the data, however, Emerson needs samples from some pretty wild waters.

"There's one place people go, come hell or high water, and that's across the Drake Passage," Emerson said.

The transit by ship from Punta Arenas, Chile, to Palmer Station, Antarctica, is no piece of cake. Veterans of the trip across the Drake Passage like to tell stories about their

See Carbon on page 10

QUOTE OF THE WEEK

I'm supposed to tell everybody they're the most good-looking, rugged men on the continent, but I can't do it with a straight face.

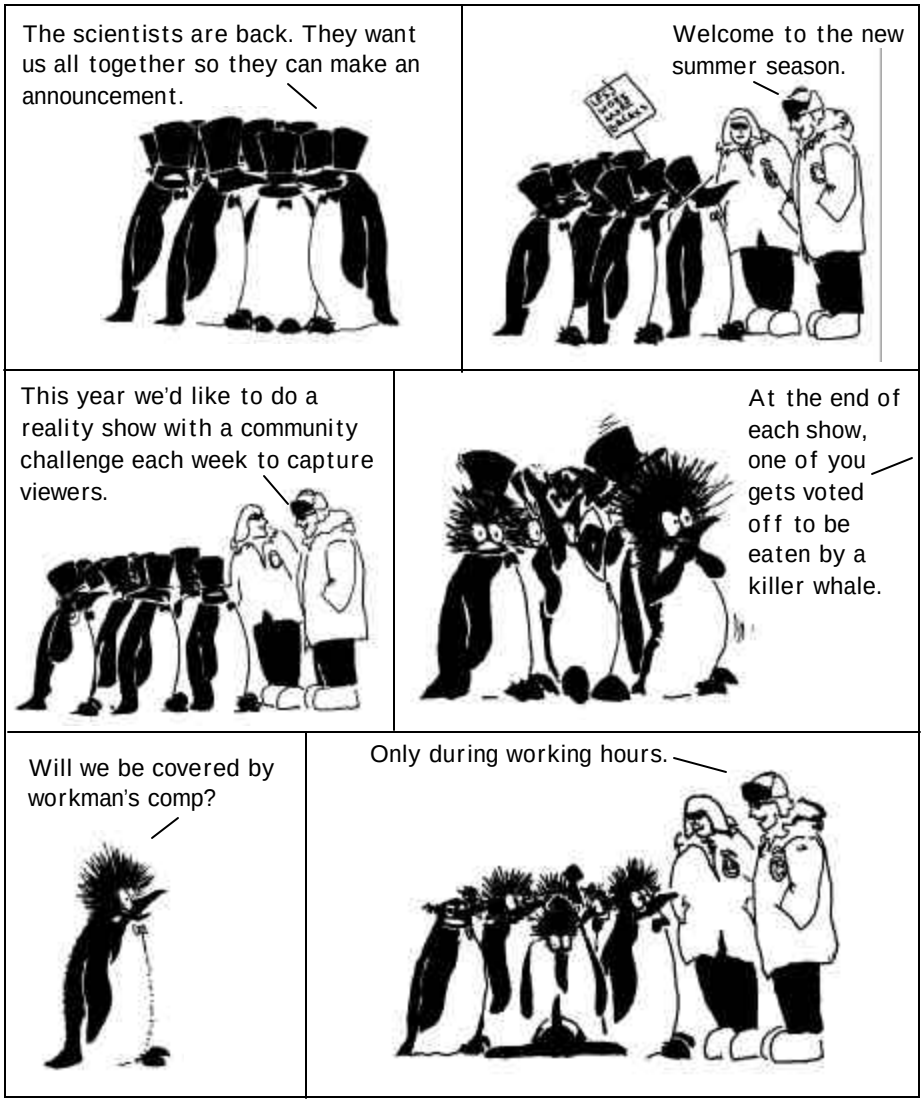
- Woman returning from a field camp

INSIDE

Understanding how the past was preserved *page 7*

New grants for recent grads *page 11*

Ross Island Chronicles By Chico



Cold, hard facts

RPSC Ice employees '04

McMurdo: **661** / South Pole: **165**
Palmer: **28 /** Ships: **23**

Contract employees (excluding ships):
Men: **525** (65%) / Women: **277** (35%)
Youngest: **19** / Oldest: **70** / Avg. age: **37**
White: **745**
Hispanic: **24**
Asian or Pacific Islander: **8**
Black: **5**
American Indian: **5**
Other/not indicated: **15**

Top 11 home states*:

Colorado: **147**	Idaho: **35**
Washington: **79**	Wyoming: **28**
Alaska: **72**	Oregon: **26**
California **49**	Florida: **16**
Minnesota: **36**	Utah: **16**
Montana: **35**	

**There is at least one person from every state.*

Other places people call home:
New Zealand: **2** / Canada: **2**
Puerto Rico: **2 /** Australia: **1**

Source: RPSC Human Resources

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matt davidson

a-one-n-two-n

SAMBA to add Palmer to network

By Brien Barnett
Sun staff

Palmer Station and Patriot Hills have drawn the latest dance cards to join other southern hemisphere sites studying the magnetosphere. This region of space protects the Earth's atmosphere from harsh solar winds and buffets storms that cause disruptions to communications and power grids.

Researcher Eftyhia Zesta of the University of California at Los Angeles runs the South American Meridional B-field Array (SAMBA). Funded by the National Science Foundation's Geosciences Directorate, SAMBA is a network of about 10 magnetometer stations stretching from the equator in Chile to other remote stations in the Antarctic Peninsula, including Bernardo O'Higgins and Vernadsky. Zesta expects to extend SAMBA's array to Patriot Hills, a blue-ice runway midway between the northern peninsula and the South Pole, and in April to Palmer Station.

The project uses sensitive devices called magnetometers, which detect electric currents flowing above in the ionosphere and sense fluctuations in these currents. Scientists then use the data to learn more about the Earth's magnetosphere, which envelops the planet, and shields the planet from the solar wind. The goal is to have magnetometers placed where electric currents running through the magnetosphere connect to the planet's ionosphere along geomagnetic field lines.

The Earth's magnetic field is similar to a bar magnet placed on a sheet of paper. When iron filings are placed next to the magnet, the filings align to the current and form a pattern of wide arching curves radiating from north to south on each side. If the filings were not present, but there was a device at the point at which each of those curves reconnected to the magnet, then one could detect any changes that were happening far away from the magnet. That's how the magnetometers help the scientists.

But to work well, many magnetometers have to be placed in generally a straight line north to south. It's at these stations where the magnetometer will read real variations in the ionospheric currents. The more magnetometers spread along a line around the Earth, the more information researchers will obtain.

Chains similar to SAMBA also are located in North America and parts of Central America. Likewise, there are chains in countries on the other side of the world, including Russia, Japan and Australia.

While the Earth spins within it, the magnetosphere remains generally in place. With a network of magnetometers on both sides of the planet, approximately 180 degrees from each other, scientists can monitor changes more easily.

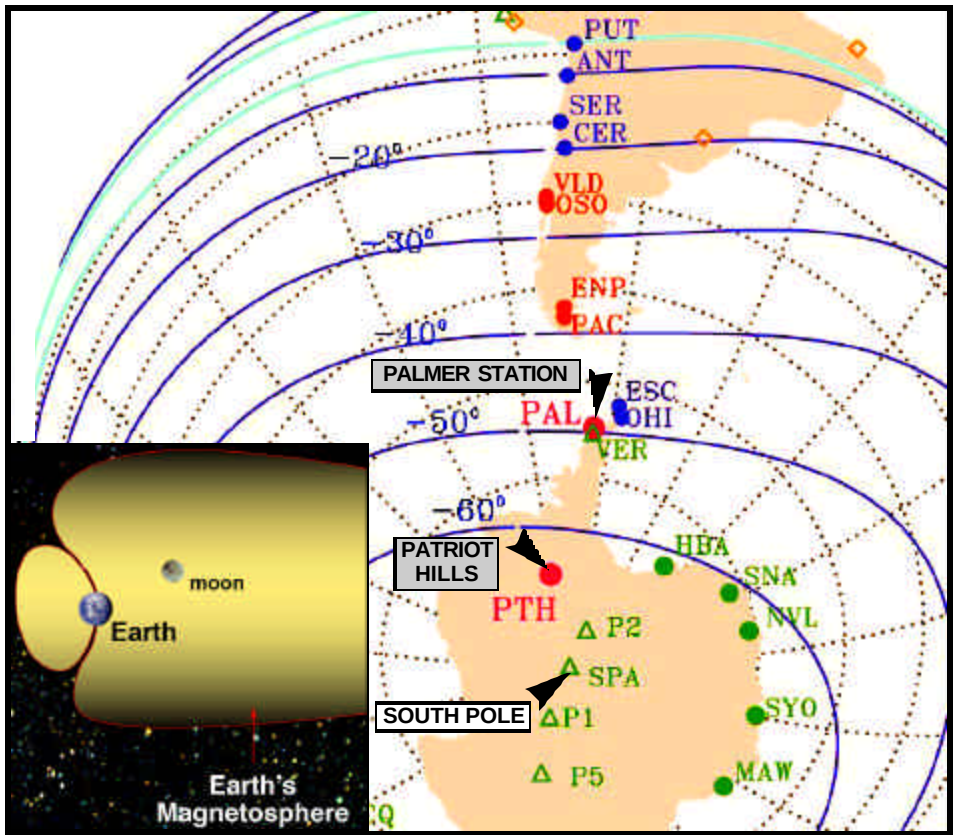
"The more latitude you cover the more range you can cover inside the magnetosphere," Zesta said.

While projects such as SAMBA try to understand the magnetosphere, other researchers learn more about the Sun and solar wind.

The collected data also are useful to those who help keep communications and power systems on Earth operating during turbulent space weather.

SAMBA has been in existence for three years and data are still being compiled. The first papers are expected sometime in December or early 2005.

NSF-funded research in this story: Eftyhia Zesta, University of California Los Angeles, http://samba.atmos.ucla.edu (temporarily offline, will be restored soon)



Inset: NASA
Above and left: Courtesy Eftyhia Zesta, SAMBA

Above: *The SAMBA network stretches from northern Chile to Antarctica. Additional magnetometer sites include stations at South Pole and polar plateau observation stations.*

Inset: *The Earth's magnetosphere (not to scale) as affected by solar wind.*

At left: *Eftyhia Zesta watches as a hole is drilled at Chile's Bernardo O'Higgins Station during the installation of a magnetometer there.*

Perspectives

Why I edit

by Susan Rogers

The author is coming to McMurdo Station this season, mid-December through mid-January, on an Antarctic Artists and Writers grant to create an anthology of Antarctic writing. She is a professor at Bard College in upstate New York and editor of many books, including "Alaska Passages: 20 Voices from Above the 54th Parallel" and "Another Wilderness: Notes from the New Outdoorswoman."

I am drawn to big places, to cold places. North. South. If I cannot go, I read. The reading gets me there, or close enough. And what I find is that most writers share a sharp awareness that they can get only so close to the truth. When faced with light on snow or ice, with air so thin breathing is velvet, with cold so insistent everything cracks, many writers lay down their pens. Words fail.

I am drawn to editing books about big places, cold places. North. South. My job then, is to help writers find those words.

In the summer of 1995 I traveled through Alaska looking for writers. I had a contract to assemble an anthology on Alaska. The task was loosely defined, but I wanted a book that showed the "real" Alaska — no Denali, no Iditarod, no clichés. The images of big mountains, fish and men are exhilarating and have their own truth, but I wanted to know the intimate details of what it meant to live in a big place: what did it feel like getting up to go to work when it is dark and negative 40 degrees?

Writers Wanted

Editor Susan Fox Rogers is seeking Antarcticans from all walks of polar life to tell their stories of their time on the Ice for a new book anthology. For more information, e-mail: SusanFoxRogers@aol.com

Finding writers is like finding mushrooms in the woods: they hide easily, and often the pretty ones are poisonous. I tacked my call for submissions to every bulletin board I could find, combed bookstores for their Alaskan writers and told everyone I met what I was doing. Shameless, I grabbed every opportunity. Once, while washing my hands in a bathroom in Denali, I explained my project to an older woman standing next to me. This woman had been living at Wonder Lake for the summer, and I thought of her as the Queen of Denali.

As we left the restroom she said, "Don't make a sham of Alaska, Susan."

People are protective of their places, I know, but her words startled me. I was there in that bathroom with her precisely because I did not want to make a sham of Alaska. I wanted to get it as right as possible; I wanted to see as much of this place as I could so I could help writers get it right as well.

Editors sit behind cluttered desks, handmaidens to this mysterious, unnatural process called writing. Or so the image goes. For a long time, this was me — I spent the eighties in New York book publishing, but a desk (and all those business lunches) was simply too constraining. When I left publishing and began editing book anthologies, I saw that my best collections emerged when I knew my subject well. The best editor knows the subject her writers are writing about. The best editor has been there.

No one really knows what an editor does, except the writer who understands he or she needs an editor in some mysterious way. They ask, "Does a scene work or not?" and, "Is more description needed?"

To edit well, I enter into the life of the writer for the space of time that I am reading, asking for more details, adding commas or suggesting another verb. This exchange, founded on a trust through words, contains an unusual intimacy.

When I returned from Alaska to my home in New York state I waited for manuscripts to arrive. And they did. "Saw your call for submissions in the laundromat in downtown Talkeetna," one contributor wrote. And slowly I pulled out those essays that rang true — a tale of raising a child in the bush, the dilemma of crossing a picket line to teach in Fairbanks, the story of fishing with a long-estranged father. Some writers had published before; others stumbled into this world because they had a story to tell. The personal essays I chose for my book, "Alaska Passages," each offered a piece of the story of Alaska, and together they created a portrait I never could have imagined. What emerged was infinitely more interesting and more complicated than what I had hoped for. When the book was complete, I realized that in the editing I had become a part of something bigger, this Alaska-in-words.

I edit because not only do I get to enter into the lives of others, I get to enter into a place.

I am traveling to Antarctica this austral summer to search for writers, to see the place that these writers will write about, to get it right. I'll seek out stories of daily life in this big place — mishaps and glory, struggle and success. When I return, I'll wait for essays to arrive from plumbers and cooks, from divers and penguin people and from those engaged in science I only approximately understand. I'm eager to see what portrait of Antarctica emerges.

around the continent

SOUTH POLE

20 LC-130 flights a record

By Peter Rejcek
Pole correspondent

South Pole station is open for business.

A record 20 LC-130 flights have made it to the South Pole already this season, the most ever before Nov. 1, according to U.S. Antarctic Program Transportation Planner Ray Gabriel. Nine flights made it by this time last season and 10 by Nov. 1, 2001.

Despite temperatures nearing -57C, the New York Air National Guard landed two LC-130s with passengers on Oct. 22, one of the earliest summer arrivals ever at Pole. Normally, the Guard flies only when the ambient temperature is above -51C.

With a third plane arriving the following day, the station population quickly ballooned from 75 to 176 in just 48 hours. While some of the winter crew expressed trepidation at the mass influx of new faces, most welcomed the new arrivals. And, just as welcome, were the boxes of fresh bananas, apples and oranges that came on those first flights.

"The synergy is there this year," said Joni English, supervisor of fixed wing operations in McMurdo. "Everyone's performance has been exceptional. Skier maintenance has kept the planes flying in adverse conditions. The 109th aircrews are committed to opening the Pole and love to fly. This achievement is shared by all ATO Personnel, Fuels, Fleet Ops, The Dining Staff, the South Pole and all other agencies."

Photo by Peter Rejcek / Special to *The Antarctic Sun*

Beth Watson awards Jake Speed a pin in recognition of his fifth consecutive winter at South Pole Station.

While the Guard arrived early and often, three Twin Otter planes and their crews trumped them by a day when they buzzed in on the afternoon of Oct. 21. Originating in Alberta, Canada, the three planes and their nine crewmen took about a week to make it to Pole, flying through such points as Houston and Cancun on their way down to South America and the jumping-off point to Antarctica, Punta Arenas, Chile.

Photo by Peter Rejcek / Special to *The Antarctic Sun*

South Pole winter station manager Pete Koson speaks with a member of the first Twin Otter crew to arrive at South Pole for the 2004-2005 season on Oct. 21.

There's definitely new energy in the air with more than 100 new people. The winter crew is looking forward to making the transition from the Ice to points both known and unknown. After gorging on fruit all morning last Sunday, scientist Justus Brevik said, "My banana craving is sated; now it's time to see some mountains and squirrels."

But before leaving, the U.S. government had a few parting gifts, including the coveted Antarctica Service Medal, one of the few congressionally authorized medals meted out to civilians. The medals were handed out Saturday night before a final performance by the South Pole winter band.

The ribbon on the medal is symbolic. The outer bands of black and dark blue comprise five-twelfths of the ribbon's width, representing the five months of Antarctic darkness. The center portion — grading from medium blue through light blue and pale blue to white — symbolizes seven months of solar illumination, and also the aurora australis.

In addition, a "Wintered Over" clasp is awarded to those who have spent the winter months on the continent. A bronze clasp signifies one winter, gold two and silver three or more winters. Of the 75 peopled who wintered, the largest group ever, only three had more than three winters under their parkas, though not necessarily at South Pole. Jake Speed had the most winters at Pole with five consecutive seasons. Unofficially, about 1,060 people have wintered at the Pole from 1957 to 2004.

On being part of such a history, outgoing winter station manager Pete Koson remarked that "a South Pole winter includes both sacrifice and privilege. Speaking only for myself, I can say that while the sacrifice has been small, the privilege has been great."

PALMER

Hands-on science

By Kerry Kells
Palmer correspondent

The majority of this past week was spent preparing for the ship's arrival on Saturday and for activities during the port call.

See Continent on page 6

the week in weather

McMurdo Station
High: 14F / -10C
Low: -8F / -22C
Max sustained wind: 29 mph / 46 kph
Windchill: -31F / -35C

Palmer Station
High: 37F / 3C
Low: 12F / -1C
Max. sustained wind: 41 mph / 67 kph
Windchill: 3F / -16C

South Pole Station
High: -45F / -43C
Low: -68F / -55C
Peak wind: 18 mph / 29 kph
Highest physio altitude: 3,342m

Continent From page 5

Before the ship's arrival we had a Science Open House with several still and active displays, hands-on science experiments and real-time data presented by the science support team and grantees. Ryan Said from Stanford University set up a display showing real-time lightning strikes from around the world. The Iron Filing Magnetic Field Visualizer allowed creative maneuvering of iron filings by magnets. "Outrageous Ooze" was another hands-on display, allowing people to manipulate a green slimy substance that was neither solid nor liquid.

The Palmer Station Microzoo was available to view in two microscopes set up by Brett Pickering. Indigenous Antarctic insects, such as the springtail, the mite and belgica antarctica, were on display. Belgica antarctica, a wingless fly, is the largest land animal in Antarctica. Even a nematode, a white, long worm with clear skin, and a tardigrade, a distant relative to the insect, had been pulled from the freezer and thawed out for display. After a winter at –70C, they were both still alive.

The research vessel *Laurence M. Gould* arrived on Saturday morning with cargo and several more researchers. During the port call, we completed our procedure documentation audit and are proud to be the first station in Antarctica to be ISO (International Organization for Standardization) certified.

The ship brought researchers Hugh Ducklow and Langdon Quetin, along with members of Maria Vernet's group and Tad Day's group.

Sunday night, John Evans gave a presentation about his first ascent of Vinson Massif, the highest peak in Antarctica, in December of 1966. Evans, who is now coordinator of special science projects, is a living legend in the Antarctic program.

Evans was one of four in the first ascent of Vinson Massif. He read from the June 1967 National Geographic story of the climb, written by Nick Clinch. Evans showed a series of stunning photographs taken during the ascent of Vinson Massif and three other first ascents of Antarctica's highest peaks: Mount Tyree, Mount Shinn and Mount Gardner, the second, third and fourth highest, respectively. All climbs were accomplished within the month and half that he and nine others were dropped off in Antarctica between December 1966 and January 1967. The slides showed pyramid-like peaks, jagged cliffs of rock and snow, base camp, camps along the routes and summit photos where they planted the twelve flags of the countries that had signed the Antarctic Treaty at that time. The three climbers with Evans to summit Mount Vinson were Bill Long, Pete Schoening and Barry Corbet.

On Monday we said goodbye to the last of the winter crew as the ship departed.

SHIPS

Nathaniel B. Palmer

Compiled from reports
by Karl Newyear

The research vessel *Nathaniel B. Palmer* endured stormy weather as it approached the ice edge on the Ross Sea Oct. 18. Winds reached up to 33 knots and the swells were higher than 3.5m.

In the late afternoon, an iceberg was sighted and after dinner the ship passed through its first band of sea ice. The ice was primarily brash, irregular and jumbled old floes. However, a significant swell was still running and the ship slowed. The ice edge marked the end of the ship's first water sampling segment and raised hopes for whale sightings and new bird species.

Three days later, Captain Robert Verret sighted the first two minke whales of the cruise.

On Oct. 25 the crew began final rigging and staging for the launch of the vertical microstructure profiler, an instrument that free-falls through the water column to about 600m depth while sending its data up a jacketed cable to a computer. The intent is to complete one cast per hour for about 24 hours to cover an entire tidal cycle. The ship had to reposition twice in the first 16 hours that the profiler was in the water, so there were short breaks in the routine. But the profiler is collecting good data and results are promising. The weather has been mostly clear with low winds. Several emperor penguins came onto the ice near the bow for a good photo op and they're occasionally sighted swimming near the cable.

Laurence M. Gould

Compiled from reports
by Dave Morehouse

The research vessel *Laurence M. Gould* arrived at King George Island to set up Copacabana Field station for penguin researchers Susan and Wayne Trivelpiece on Oct. 21.

The Trivelpieces have been studying Adelie, gentoo and chinstrap penguins on King George Island for 25 years. They keep track of the number of penguins and chicks, what they are eating and how well they are surviving. In recent years they've been monitoring how changes in the sea ice and the abundance of krill may change the penguins' diet and breeding.

After continuing on to deliver supplies to Palmer Station, the *Gould* stopped again at Copa to deliver new supplies and troubleshoot some issues with the camp's high-frequency radio and propane connections before returning north to Punta Arenas.

Continental Drift

What's the most important thing you brought with you to Antarctica?

"Pictures of my niece."

Ann May,
McMurdo cargo handler,
Long Prairie, Minn.
three seasons

"My CDs, for music."

Gary Jirschle,
Palmer maintenance specialist,
Portland, Ore.,
11 seasons

"Windstopper hat, prescription sunglasses, my husband."

Kim Miller,
South Pole cargo handler,
Morrison, Colo.,
first season

Fossils take time

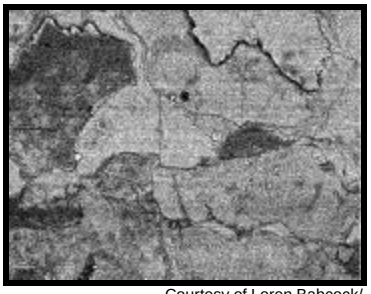
By Kristan Hutchison
Sun staff

In geologic time, the year since researchers collected fossils from Antarctica last season was nothing.

A few fossils were identifiable in the field, like the dinosaurs found on Mount Kirkpatrick, but most discoveries required further study in the lab. The heavy boxes arrived at their destinations in April and since then, the researchers have been cataloguing and scrutinizing the contents. Some researchers found treasures hidden in the boxes of rock and some are still looking for answers.

Photo by Loren Babcock / Special to *The Antarctic Sun*

Paleontologist Loren Babcock found well-preserved fossils and remnants of ancient hydrothermal vents around Carapace Nunatak, on the northwest edge of the Dry Valleys near McMurdo Station.



Courtesy of Loren Babcock/
Special to *The Antarctic Sun*

Highly magnified archaebacteria show up as a network of black lines on this scanning electron microscope image of limestone from Carapace Nunatak.

Decay turns to decades

Ancient bacteria trying to decompose crustaceans, instead preserved them for 180 million years.

Paleontologist Loren Babcock discovered the link between bacteria and Antarctica's remarkably preserved fossils using an electron microscope on samples he'd brought back from Carapace Nunatak. Little round cells covered the once-soft body of a conchostracan, or "clam shrimp," as though it had been caught under a shower of hail.

"It doesn't look like much, but scientifically it's really important," Babcock said from Ohio State University.

He recognized the cells as bacteria, confirming something he'd begun to suspect. The fossilization of spiders, crustaceans, insects and other arthropods was triggered by the very bacteria that decay them.

The bacteria had coated the clam shrimp to decompose it, but in the process they set off a chemical reaction in the water around them. The bacteria created the right conditions for calcium phosphate or silica to coat both the bacteria and their meal, turning it all to stone.

"Now we understand how they get preserved," Babcock said. "They get preserved by the bacteria that are responsible for their decay, so that dramatically changes our understanding of the fossilization process."

Bacteria had been associated with fossils before. In fact, while at McMurdo Station last season Babcock was editing a paper for one of his graduate students about the possible role of bacteria in fossilization. Then he went into the field with Alycia Rode, a postdoctoral researcher, and Steve Leslie, a professor at the university of Arkansas-Little Rock. Together they collected the fossils that would confirm the role of bacteria in fossilization, only he didn't know it until he and his research team looked at the fossils under the scanning electron microscope.

The images changed how Babcock looks at the rest of his fossils.

"Except for bones, teeth and shells, which are basically already mineralized, it's the other things, skin and internal muscle and stuff like that, that we never really understood how they got preserved," he said.

He pulled other fossils from around the world out of his collection and took closer looks at them.

"Not just from Antarctica, but from all over the world and all different ages. It looks like the same situation turns up everywhere," Babcock said. "Wherever we've got good specimens we see bacteria and sometimes fungi."

The only problem encountered looking for

See Fossils on page 8

Fossils From page 7

bacteria was that where he'd diligently prepared a fossil by scraping, cleaning and polishing it, the bacteria were knocked off in the process. From now on, Babcock said he'll keep his fossils just as he finds them in the field.

Realizing that each fossil was composed of multitudes of bacteria changes Babcock's understanding of the fossil record as well.

"Now, instead of regarding bacteria and fungi as the rarest of all fossils, it's beginning to look like they are the most common," Babcock said. "If they are responsible for preserving these non-mineralizing creatures, then they have to be actually incredibly common, because it takes quite a few of them to preserve just one body of something else."

Hot springs

Photo by Loren Babcock/Special to *The Antarctic Sun*

Postdoctoral researcher Alycia Rode stands beside unusual patterns of limestone near Carapace Nunatak in 2003. The limestone patterns are evidence of hydrothermal vents.

The bacteria-coated fossils came from another of Babcock's finds — the first hydrothermal vent identified from Jurassic Antarctica. Rounded mounds of ancient lava, called pillow basalts, were the tell-tale sign that a volcano had been venting underwater in the area near Carapace Nunatak. Small organisms lived in some of the warm pools.

Babcock suspects many similar hydrothermal vents existed throughout the Transantarctic Mountains.

"I'll bet there are more there. It makes sense," he said. "I don't think they've been interpreted quite that way before, but thinking about it, it's obvious some of these things must be."

Another type of microorganism, called archaebacteria, may be responsible for another strange phenomenon within the thermally heated pools. Archaebacteria represent a bacterial group that emerged 3.5 billion years ago and live in environments such as hydrothermal vents, bogs and salt lakes. Babcock found limestone deposits laid down in the most unusual way he'd ever seen. The limestone coated the surfaces of the basalt pillows, rimming them.

"They're not being deposited horizontally like they normally are in the Bahamas and places like that," Babcock said. "They're instead forming around volcanic rock in the weirdest situation I've ever seen for a limestone."

When he looked at samples, Babcock and his team again found archaebacteria, which apparently had caused the deposits. The limestone was shot through with tiny, black squiggly lines that looked like Silly String. The lines closely resembled archaebacteria from modern hydrothermal vents.

"This is the first time we've ever seen this anywhere, let alone Antarctica," said Babcock, who will present his findings at the Geological Society of America's annual meeting in Denver on Nov. 10. "It's really cool. We figured out two really important processes."

On track

Photo courtesy of Molly Miller/ Special to *The Antarctic Sun*

Molly Miller is trying to determine what animal made these tracks, found fossilized in rock near Beardmore Glacier.

On her last day in the field, Molly Miller spotted the tracks of an animal preserved in stone near the Beardmore Glacier.

A dozen 2-cm-wide prints scurried anonymously along for almost a meter. Miller has sent molds of the prints to experts worldwide, hoping to identify what sort of animal it was. The prints were left about 250 million years ago, so if they were left by a reptile or amphibian, it will be the earliest record of a vertebrate from Antarctica.

"It was a small little bugger," Miller said, from the Department of Earth and Environmental Sciences at Vanderbilt University.

The area where Miller found the tracks would have been a huge lake when the prints were made along its shoreline. She and University of Wisconsin sedimentologist John Isbell use tracks, burrows and other clues left in the hardened sediment to understand what animals were doing 250 million years ago.

"It's a very lively process and it's very exciting because you're not just finding a dead bone or a dead shell; you're actually finding the activity of an animal," Miller said. "You can tell what it was doing hundreds of millions of years ago."

They also found a half-dozen trackways along the shorelines of prehistoric lakes and rivers. These tracks may have been made by small reptiles or perhaps by arthropods.

"We now know what to look for and we think it's very interesting that we have found these things in some places and not in others," said Miller.

Snail's pace

Working through the 60 crates of samples from Antarctica will take well into the spring, said paleontologist Allan Ashworth. In July he published a paper based on fossils he'd collected from the same general area in 1995-96.

"It takes a long time to go through that material, pick it out and then to actually find people who can work on it," Ashworth said from North Dakota State University.

So far he's found several freshwater snails among the new samples. The snails are interesting because of the puzzle they pose about how they got to the isolated lakebeds where they were found. Ashworth believes birds might have carried them, perhaps ducks or geese that could have migrated to the Antarctic in its warmer days.

While most of the fossil-work will take longer, Ashworth will present papers at the Geological Society of America providing an analysis of the long, complex history of glaciation around Oliver Bluffs where he was working.

NSF-funded research featured in this story:
Loren Babcock, Ohio State University,
http://www.geology.ohio-state.edu/~lbabcock/
Molly Miller, Vanderbilt University,
http://exploration.vanderbilt.edu/news/features/miller/news_miller.htm
Allan Ashworth, North Dakota State University,
http://www.ndsu.nodak.edu/instruct/ashworth/

A Hagglund vehicle sits on McMurdo Sound sea ice in front of the Barne Glacier during training Oct. 25. The cracked area on the right marks the transition from multi-year sea ice on the right to first-year sea ice on the left.

Photo by Emily Stone / *The Antarctic Sun*

Ice

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U.S. Antarctic program.

More optimistically, for the first time in three years the ice in the channel is only a year old. Last year the combination of a wide channel and a well-timed windstorm blew it clear, Sutherland said.

"If you have first-year ice it's going to be thinner. If you have older ice that has been broken up but remained in the channel as rubble, it reforms like concrete," Sutherland said. "So it's great that everything blew out last year."

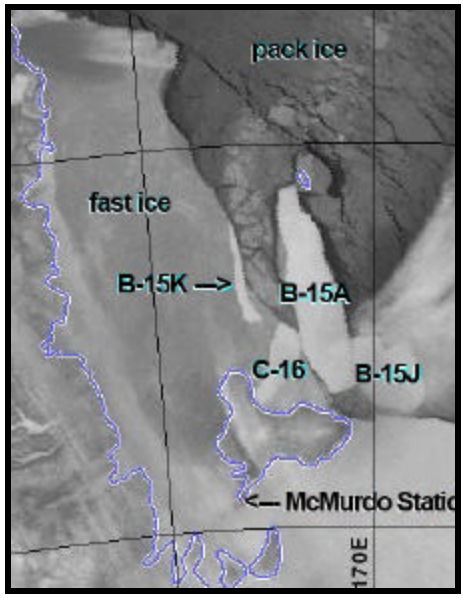
The channel shows up clearly as first-year ice on satellite images. Until July, prospects were looking good for an easy entry this season. Then the open pack ice swiftly froze to the Drygalski Ice Tongue. The ice continued to thicken through October, with internal temperatures averaging –16C and colder, according to the sea ice report by field safety instructor Brian Johnson. In the channel, the ice averages 2.5 m. The ice thins to about 1.5m near Cape Royds and Cape Bird, where the ice is newer.

What's bad for the boats is good for the planes. At the ice runway, the multi-year ice is about 5.4m thick.

"If a significant portion of that 100-mile, first-year ice does not blow out, then we will have this extremely long channel and it won't blow clear this year," Sutherland said. "We've never really had anything like that set-up before, so we just don't know what's going to happen."

The last four years the Coast Guard sent two icebreakers down to handle the extensive ice. This year, only one is available.

Two of the *Polar Sea*'s three main motors are condemned, and the ship is being fixed in Todd Shipyard in Seattle, Brown said. *The Healy*, which came down in January 2003 to assist the *Polar Sea*, is busy on an arctic mission and won't be back in time to make the needed preparations. That leaves the *Polar Star* as the lone icebreaker, unless reinforcements can be found elsewhere.



A recent satellite image shows how the sea ice has filled in all the way to the Drygalski Ice Tongue.

Nature may still help out too. Johnson spotted a few cracks across the sea ice where it could begin to break apart. Warm weather and windstorms could also speed the ice to melt, break and blow away. The National Oceanic and Atmospheric Administration Climate Prediction Center, as well as several climate models, forecast warmer than normal conditions along the ice edge and over the Ross Sea, which would help thin the ice.

"On the other hand, the bottleneck caused by the Drygalski Ice Tongue and the multiple B15 bergs looks like it is only helping to hold things together," Johnson said.

The collection of four icebergs piled up near Franklin and Beaufort islands has created an artificial breakwall, said Doug MacAyeal, who has been studying the bergs for four years. The placement of the bergs diverts currents that normally flush sea ice out of McMurdo Sound to the narrow gap between B15K and B15A, which doesn't help the icebreakers.

Until the bergs move away, the sea ice is likely to remain a problem. Icebergs C16 and B15K are grounded, while B15A continues to move with the tides. During the large May 15 storm, B15A nosed its way to the other side of Franklin Island, opening up the possibility of it swinging around and battering B15K.

"B15K is very vulnerable, because it's a sliver," MacAyeal said. "It's very long and narrow."

The *Polar Star* is scheduled to leave Seattle Nov. 1 and arrive at the ice edge Dec. 30. A fuel tanker is expected at the ice edge Jan. 16, to serve as a floating gas station for the breakers until the channel is completed. The resupply ship, *American Tern*, is still scheduled to arrive in McMurdo Feb. 1, Brown said.

This was Brown's final week with the Coast Guard. LCDR. Don Peltonen will replace her this season, overseeing ship operations at McMurdo Station.

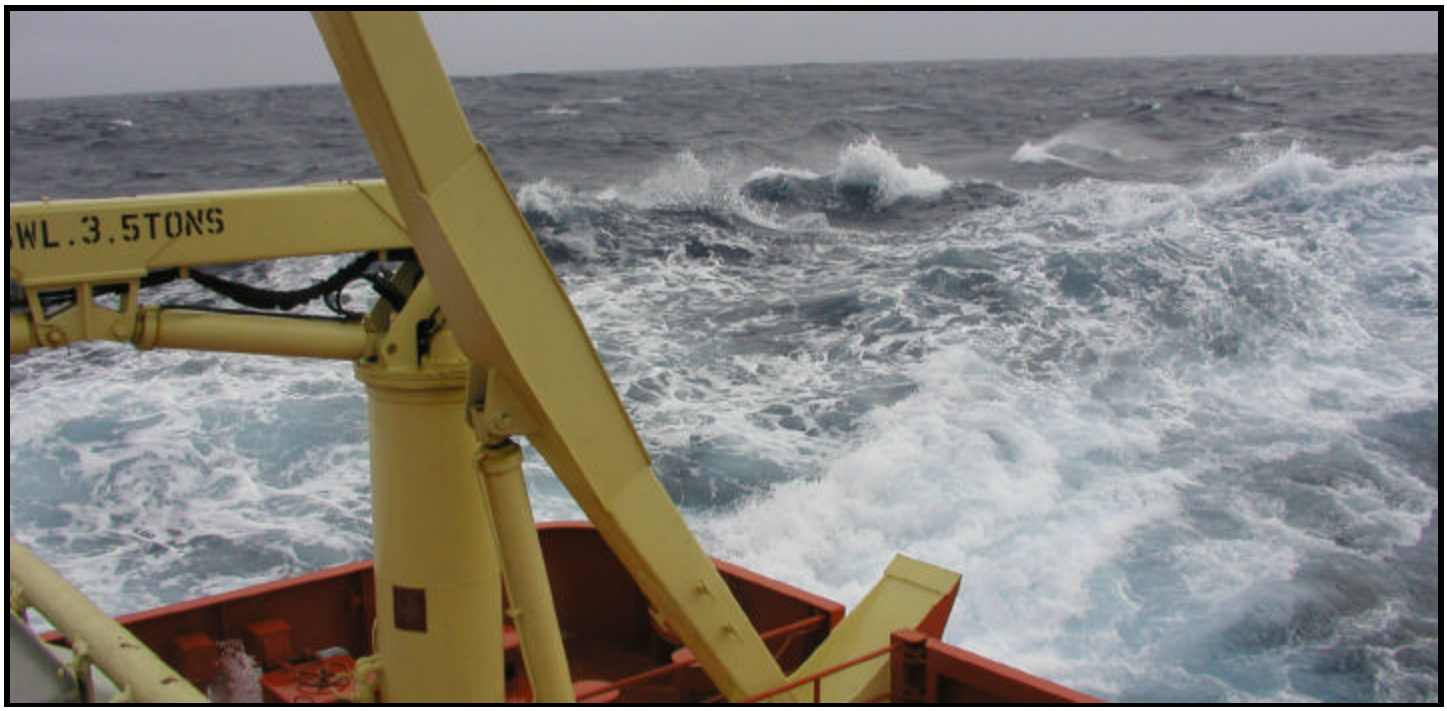


Photo by Kristan Hutchison/*The Antarctic Sun*

Above, the Drake Passage stirs up frothy waves for a crossing in September 2003. Below, after drawing water from the turbulent Drake Passage, Charles Stump runs tests last month in a lab aboard the Laurence M. Gould*. The water samples will be tested for various ratios of gasses. Those ratios may help scientists quantify the amount of air that mixes with the world's oceans.*

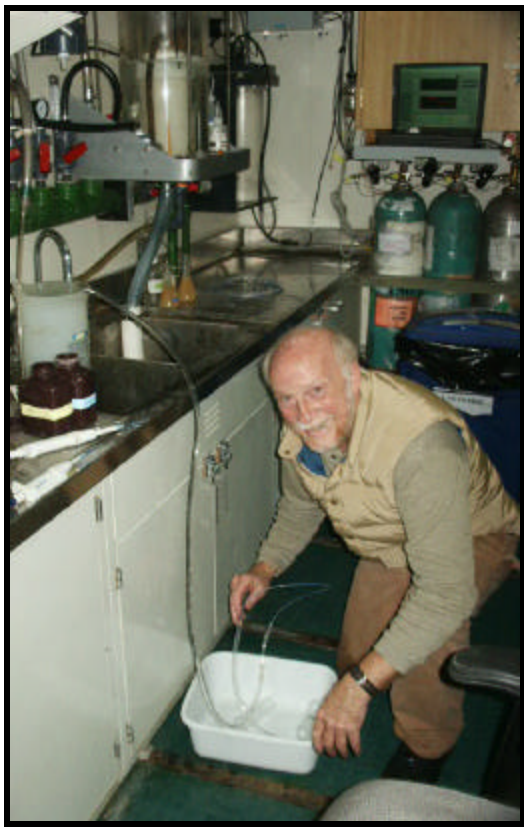


Photo by Tom Lehman/Special to *The Antarctic Sun*

Carbon

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fellow passengers getting jostled and sick. Eating something other than crackers during the five-day trip can be an accomplishment.

Emerson and oceanographer Charles Stump are hoping for large, crashing waves, the kind that can be found only out in the wild open ocean. That's where they suspect large amounts of carbon dioxide, argon and other gasses are captured by the whitecaps of waves and super-saturate the ocean.

Stump explained that scientists know what the ratio of the gasses is in the atmosphere and in the ocean, but are not sure about the ratio where the air and ocean meet.

"We will use it as a tracer of bubble injection," Stump said. That tracer will then be used in calculations for various models.

Last month, Stump was aboard the research vessel *Laurence M. Gould* during its run from Punta Arenas to Palmer. During the voyage, Stump collected water samples from the sloshing waters around the ship.

Stump probably was the only one aboard to come away a bit disappointed.

"It was not rough at all. I was hoping for more," Stump said. "Palmer people were calling it the smoothest crossing we ever had."

It wasn't the fault of the ship, her crew or anyone on board, he said. It's that the waves just weren't as crazy as he wanted them to be. He probably will get a rough ride before he's finished. The project has at least two more cruises to make, including one in June, when the waves are most certainly going to be harsher.

During the voyage, Stump draws water from the ship's onboard pump as well as from sampling devices cast over the side of the ship. The samples are taken at relatively shallow depths of 2m deep from the pump and 10m deep on a cast.

"The reason we're doing this is because these gasses are super-satured," Emerson said.

Crews try to avoid sampling water that may have been disturbed by the ship's wake, as that would introduce a level of error.

For comparison purposes, the *Gould*'s crew also collected water from 4,000m deep. The deep water will be compared to the wave samples as well as water elsewhere.

The samples, about 120 of them, will be analyzed back in Seattle. If the team can determine a consistent ratio of gas in the water from the various samples they will use that information along with other factors to guess at some key Earth cycles. Along with satellite imagery, the new method may help researchers worldwide detect changes in climate. From there it will be a matter of checking on waves in other parts of the world to ensure the Drake is a good model.

NSF-funded research in this story: Steven Emerson, University of Washington School of Oceanography.

Post-docs get polar projects

NSF's Office of Polar Programs awards three fellowships for new scientists to study Antarctica

By Emily Stone
Sun staff

What can fish, phytoplankton and bacteria tell us about global warming and the effect of the ozone hole on Antarctic ecosystems?

Three science projects soon will begin studying these questions thanks to new post-doctoral fellowships awarded last month by the National Science Foundation's Office of Polar Programs. The office awarded six fellowships — half in Antarctica and half in the Arctic — under this program, which is the first time Polar Programs has offered post-doctoral fellowships.

Normally the only way new scientists get to do polar research is if established grantees select them to work on a project, explained Bernard Lettau, the program officer for the fellowships.

Lettau said the NSF wanted to give recent PhDs who are interested in polar science a way to work in the field, something that has historically been difficult. "It's an opportunity to try things in a different way ... other than to have old Antarctic hands pick their successors," he said.

> *"It's an opportunity to try things in a different way ... other than to have old Antarctic hands pick their successors."*
>
> — Bernard Lettau, program officer for the new fellowships

Of the three researchers who were chosen this year for Antarctic fellowships, only Brad Buckley will set foot on the continent. Buckley, a post-doctoral fellow at Stanford University, will come to McMurdo Station next October to study how fish react to even a slight change in water temperature.

For the most part, Antarctic fish cannot handle warmer water, Buckley said.

"It's lethal to these fish," he said. "They're really, really wimpy. … They've pretty much lost the ability that other fish species have to withstand even moderate changes in temperature."

Buckley will fish for bernacchii, a 20- to 25-cm-long type of rock cod that is common in the water around McMurdo. He will bring the fish to the Crary Science Lab aquarium and monitor them during short- and long-term temperature changes of up to 6 degrees Celsius. He will then dissect the fish, send frozen tissue samples back to Stanford and study how the fish reacted biologically to the temperature change.

His goal is to better predict how global warming will affect Antarctic marine animals.

Brook Nunn, a post-doctoral researcher at the University of Washington in Seattle, will look at what mechanisms limit phytoplankton in their ability to remove carbon dioxide from the atmosphere. She will spend six weeks on the research vessel the *Nathaniel B. Palmer* next year doing her fieldwork.

Phytoplankton are able to draw large amounts of carbon dioxide out of the atmosphere, Nunn said, but there appear to be limits on what they can achieve. She will look at whether it's possible to fertilize the ocean with iron to create a larger phytoplankton bloom, and thus pull more carbon dioxide from the atmosphere. The carbon dioxide would then be degraded by bacteria, which release carbon dioxide into the depths of the ocean where it potentially can be stored for hundreds of years.

Kenia Whitehead will conduct her research at the Institute for Systems Biology in Seattle beginning in December. She will look at the effect of increased UV radiation on cyanobacteria in Antarctic lakes.

"Understanding if they survive and how much (UV radiation) alters them shows how much effect the ozone hole has on this community," Whitehead said. "Is it making life harder for them overall?"

The goal is to conduct this research using the genome of an Antarctic bacteria. But because that genome has not been completed, Whitehead will look at a "close cousin" of the Antarctic cyanobacteria to understand how the research can best be done once the genomes of the Antarctic bacteria are sequenced. Whitehead said she doesn't know when that will happen, but her goal is to be ready when it does.

The Office of Polar Programs chose the six researchers from a 22-person applicant pool, Lettau said. The $70,000-a-year fellowship is for two years, with the possibility of extending it an extra year. The goal is to award two more rounds of fellowships in the next two years.

Buckley, Nunn and Whitehead said they were thrilled at the rare opportunity to do their own polar research at this point in their careers.

"I'm glad they have these post-doctoral fellowships," Whitehead said, "because of the opportunity it gives you scientifically that you might not get otherwise. I don't have the credentials, necessarily, to go into a full-blown genomics lab. I'm not somebody they might have considered otherwise. This really gives you the opportunity to do something different."

Profile Teacher dives into science

R.I. woman shares experience with students

By Brien Barnett
Sun staff

Seventh-grade science teacher Elizabeth Gibbs doesn't much care for the comic book image of mad scientists. Instead, she's out in the field trying to show her students back home what it's like to do science for real.

From counting dolphins in New Zealand to helping Antarctic diving researchers learn more about underwater ecosystems, Gibbs has had real-life science experiences she can take back to her classroom in Newport, R.I.

Gibbs arrived in Antarctica about three weeks ago to help study organisms living on waste in the sound outside McMurdo Station. Stacy Kim of San Jose State University's Moss Landing Marine Laboratories heads up the project.

"I thought it would be cool to be a part of a dive project," Gibbs said.

She and Kim were in contact before Gibbs arrived at McMurdo Station and any concerns that the teacher wasn't up to the job quickly washed away.

"She's totally awesome and a huge benefit to the team," said Kim. "Some of this stuff is really hard work, like chipping ice holes, and she's done a great job."

Gibbs was sent to Antarctica as part of the ARMADA/Teachers Experiencing Antarctica project, which is partially funded by the National Science Foundation. While here, she's been maintaining an online journal for her classroom back at Thompson Middle School. She had a chance to chat with the class from McMurdo and tell them what it's like to live and work in Antarctica.

"The kids were excited and more curious than normal," said Kathryn Thyne, who is substitute teaching for Gibbs while she's at McMurdo Station. "It's opening their eyes to what's out there."

Gibbs said she's also received positive remarks from parents who see their kids light up when they talk about their day.

Some of the other things she's done here include working with video and still cameras, recording information about the dives, helping the divers get on their gear and even rounding up penguins for the annual penguin ranch project.

"I enjoy going to the dive site, getting out and watching the action and seeing how to do everything," she said. "It's neat when the science samples come up."

Photo by Stacy Kim / Special to *The Antarctic Sun*

Elizabeth Gibbs and Mike Donnellan help diver Bob Zook suit up to dive near the Cinder Cones area in McMurdo Sound. Zook was diving to collect microorganisms as part of a project to study the area's ecosystem.

Before Antarctica, Gibbs spent a few weeks helping to count and monitor dolphins in the ocean around Kaikoura, New Zealand, with the Earthwatch Institute. That experience and her time in Antarctica make her a better teacher, she said. Plus, seeing such a different place is rewarding.

"Antarctica is beautiful," she said. "It's spectacular, threatening and peaceful all at the same time."

Photo by Jean Pennycook / Special to *The Antarctic Sun*

Seventh-grade teacher Elizabeth Gibbs listens to one of her students ask a question during a 3:30 a.m. phone call to her class on Friday. The call came at the start of the school day in Rhode Island.

The goal of the program is to give teachers real world experience. Gibbs said that is invaluable.

"I'm getting to see scientists in action and how much it takes … logistics, preparation, planning and worrying."

When she gets back to her classroom, Gibbs said she immediately will present slides and information to the school. She'll work in the long term to develop lesson plans that involve sampling waters near the school for small organisms and to promote a deeper understanding of Antarctica.

She encourages all teachers to take advantage of any such opportunities, whether on the Ice or elsewhere.

"Seek out a way to do this," she said. "I can't image not wanting to have the opportunity to do this. It's important for kids to understand what science is all about."

NSF-funded projects in this story: Teachers Experiencing Antarctica, http://tea.rice.edu/tea_gibbsfrontpage.html, http://www.armadaproject.org/, http://tea.rice.edu/; Stacy Kim, San Jose State University-Moss Landing Marine Laboratory, http://aspire.mlml.calstate.edu/aspire04/index.htm