season finale
The Antarctic Sun

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

February 1, 2004

Photo courtesy of Australian Defense Force

A boarding team from the Royal Australian Navy fast-ropes onto the fishing vessel Maya V *from a Seahawk helicopter on Jan. 23. The* Maya V *was apprehended for allegedly fishing illegally near Heard Island.*

Fighting over fish

Antarctic research used to defend fish in the Southern Ocean

By Kristan Hutchison
Sun staff

Two kinds of ships cast lines and nets into Antarctic waters – those fishing for cash and those trawling for answers.

Over the last decade, legal and illegal fishing fleets have come farther south into Antarctic waters, filling their holds with krill, Patagonian toothfish and mackerel icefish. Researchers sample the same seas, trying to understand the marine resources in order to protect them from overfishing.

"If you're going to make intelligent judgments about how much is too much in fishing management, you need to know what's going on," said Dan Evans, a seabird researcher with the National Science Foundation supported Long Term Ecological Research project at Palmer Station.

For both fishermen and scientists, the stakes are high. The payoff for a metric ton of Patagonian toothfish is about $7,000, but in certain areas where pirate fishermen are taking fish without regard for the regulations, scientists have cautioned that toothfish could be decimated in a few years,

See Fishing on page 16

Tectonic puzzle

Sea floor map could lead to climate answers

By Kris Kuenning
Sun staff

If plate tectonics is the science of putting the world puzzle together, then the Antarctic continent is the missing jigsaw piece.

Our planet is in constant flux. As part of the tectonic plates, continents slowly move across the globe. How much of them is exposed depends on how much of the oceans are locked up in ice.

Marine geological survey information and the core samples from below the Ross Sea floor will help researchers piece together the elusive climate history from the early Cenozoic era, 30 million to 65 million years ago, and get more details of Antarctic plate tectonics from that time.

"Antarctica is the keystone to plate tectonics of the world," said researcher Bruce Luyendyk of the University of California, Santa Barbara.

Plate movements are calculated by comparing their positions in relation to each other. With little information about Antarctic tectonic shifts, past and present, large question marks are left in the equation.

The Cenozoic era is important because it was a time of major climactic transition. A warmer period, described as a greenhouse Earth, gave way to our current, cooler climactic

See Tectonics on page 14

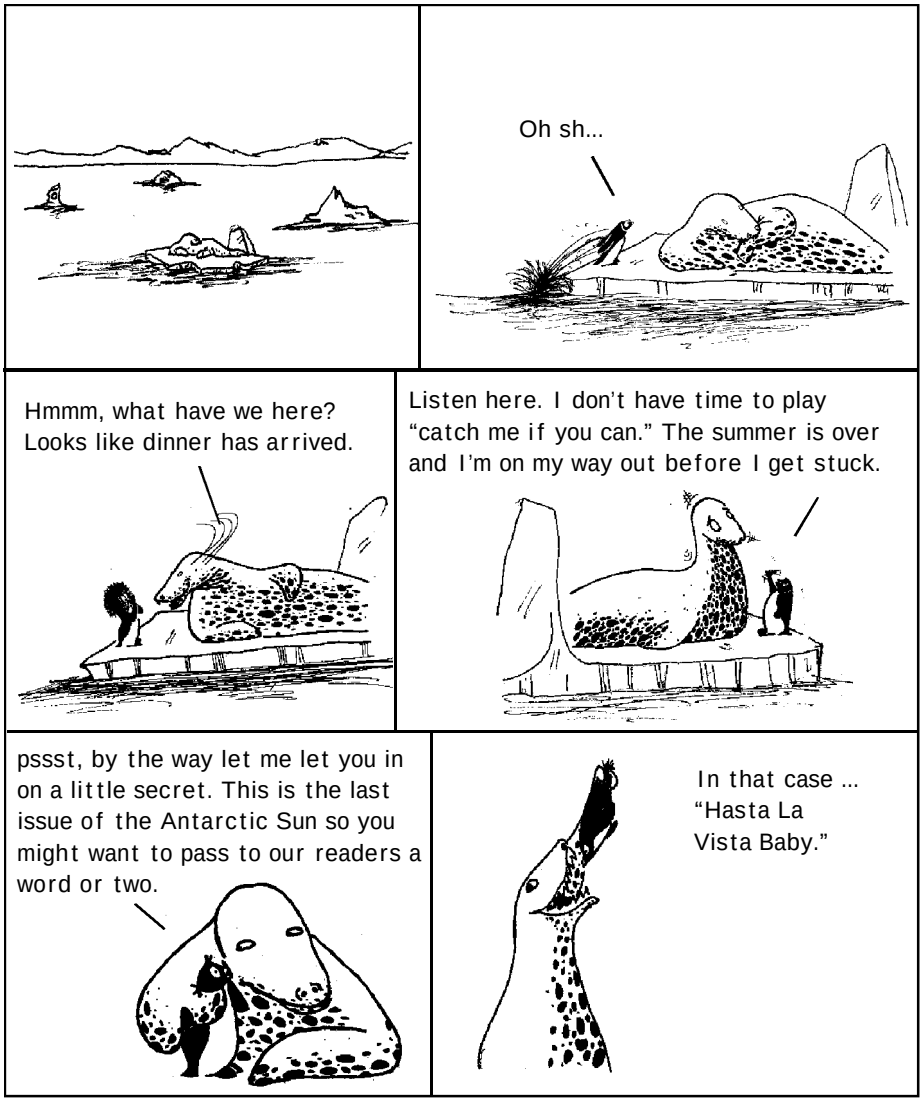
INSIDE

Quote of the Week

"If you find yourself in a bad situation, please try to avoid it."

- Offload safety advice given at an all-hands meeting

Ross Island Chronicles By Chico



Cold, hard facts

Antarctic Sun 2003-04

Time paper is distributed each Sunday: **by 9 a.m**

Copies made this season, through Jan. 30: **112,838**

Dryer sheets used to keep copier running static-free: **5**

Highest number of Web site visitors in one month: **22,709**

Clocks on the wall: **3 (McMurdo, Denver, D.C.)**

Kilos of C4 coffee shipped from New Zealand to sustain habit: **6**

Most effective holiday nut cracker: **Can of Chef Boyardee Spiderman pasta with meatballs in tomato sauce**

Countries we received e-mail from: **U.S., United Kingdom, New Zealand, South Korea, France, Sweden, Belgium, Germany, Slovenia, Panama**

Mothers who e-mailed us to forward messages to their son or daughter: **2**

Source: Antarctic Sun staff

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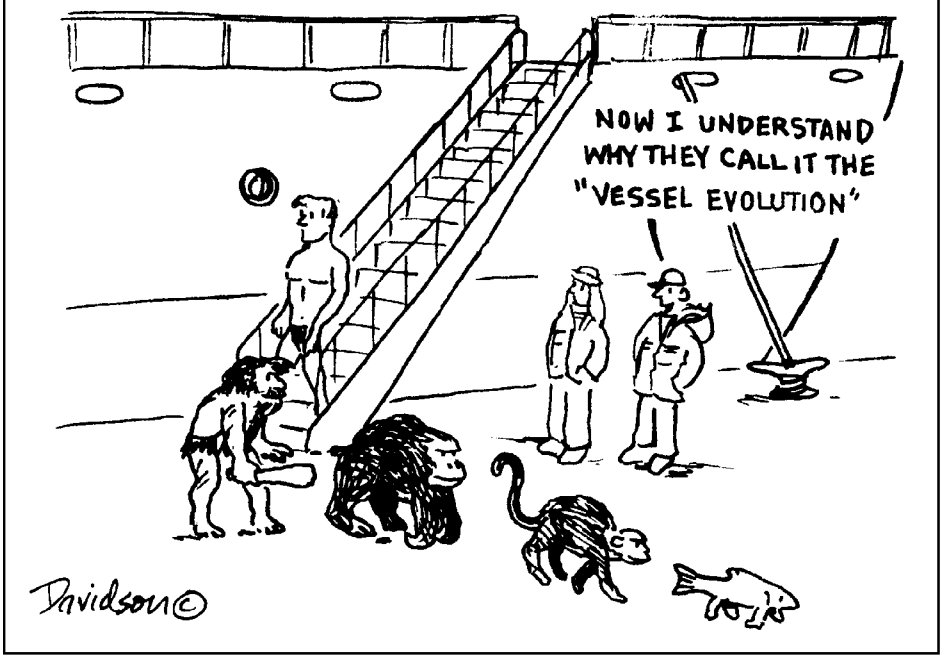
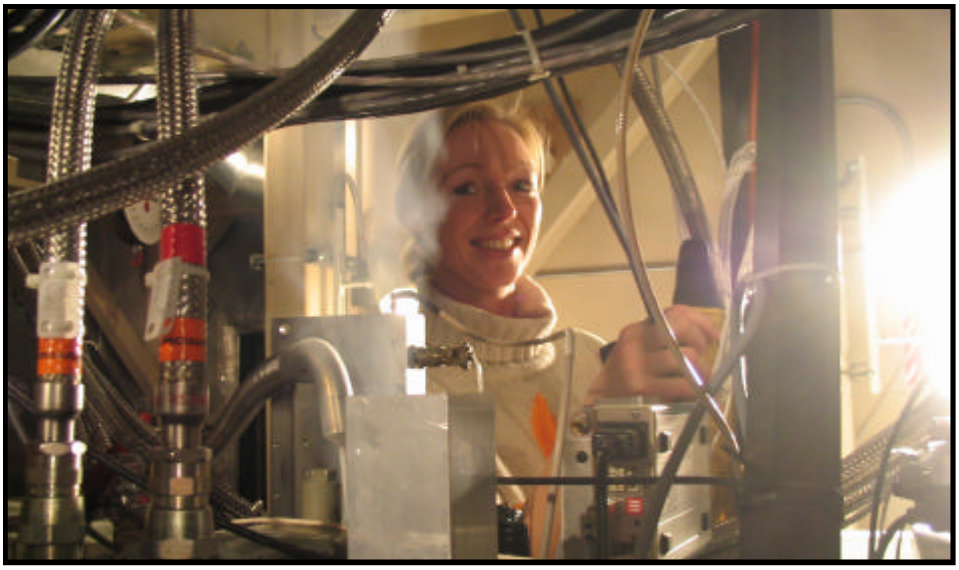
Matt Davidson





Left, a researcher peers through the workings of the machine.

Below, laser technician works on the new laser receiver for AST/RO.

Photo by Kris Kuenning / The Antarctic Sun

Looking at the universe in a different light

By Kris Kuenning
Sun staff

People have looked at the stars for thousands of years, but only about 20 years ago did astronomers become interested in the stuff inbetween.

Reversing their focus on the sky, astronomers can see that dark patches in the Milky Way are really giant molecular clouds. These big blobs of gas can be many times the size of the sun. Eventually, these clouds fall in on themselves, the cool gas becomes hot and dense and a star is born.

"The details are tricky. We still don't know how it really works," said a South Pole winter scientist Nicholas Tothill from the Smithsonian Astrophysical Observatory.

This process of how they form could answer a lot of questions about stars themselves: why are they as big and heavy as they are? Why are there more light stars than heavy stars and more red stars than blue stars?

"That is determined by what goes on in the galaxy – by molecular clouds," Tothill said.

"Stars are fairly well understood," he said. "But the gas – where they come from and where they go to – we have to understand this stuff."

At the South Pole a 1.7mm telescope named AST/RO (Antarctic Submillimeter Telescope and Remote Observatory) has been measuring galactic gas clouds since 1995.

Other, similar telescopes operate 16,000 feet high in the Chilean desert and from aircraft and satellite, but the dry air over the South Pole makes the best land-based viewing site in the world.

"In submillimeter astronomy, light gets absorbed by atmospheric water vapor so cold, dry air is very good stuff," Tothill said.

AST/RO picks up submillimeter-wave radiation emitted by dense gas and dust between the stars.

These areas seem black to the human eye but the gas molecules actually emit a non-visible light. The wavelengths of that light can be picked up by submillimeter telescopes like AST/RO.

Concentrating on the wavelengths given off by highly excited carbon monoxide molecules, AST/RO can locate star-forming cores and study the structure and movement of molecular clouds and how the other elements in the galaxy affect them.

Winter is the prime observation time for AST/RO, when the water vapor concentration is lowest so summers are mostly dedicated to maintenance, repair and development work.

The researchers want to minimize the chance of something going wrong during the isolation of winter.

Last year, a new laser-driven receiver was installed. Tothill said the new receiver would provide a higher, more stable frequency for the telescope.

It is the highest-frequency radio astronomy receiver in the world. The lower frequency receivers, were only a few centimeters in size but a larger and heavier device is needed to operate at frequencies of 1400 gigahertz.

"Basically, we've replaced something that weighed a few ounces with something that weighs 3,000 pounds (1,360 kg). The only place we could do that is from the ground."

The two-meter long receiver, which was fine tuned by technicians over summer, will be mounted to the ceiling in the cramped building 800 meters from the geographic South Pole.

The actual telescope is on the roof of the building. It sends the radiated light to the receiver through a series of mirrors.

The project is headed by Antony Stark of the Smithsonian Astrophysical Observatory. AST/RO works as a consortium, with participants from several universities and accepts research proposals from the wider scientific community.

NSF funded research in this story:
Antony Stark, Smithsonian Astrophysical Observatory, www.harvard.edu/~adair/AST_RO

Perspectives

Megadunes reveals complexity of nature

By Ted Scambos

Six years ago, my colleague Mark Fahnestock came into my office with a mystery. "Look at this," he said, "this doesn't make sense." On his laptop computer was a color map of temperature for Antarctica – not air temperature, but temperature down in the snow. Like a lot of weather data for the Ice, it was all concentric rings following the coast, coldest at the center, with one exception. A blotch, shaped a bit like three feathers spread on a wing and about the size of Montana, distorted the color bands in an area near Vostok Station; it was colder there by far than it ought to be. We rifled through old files to get weather satellite pictures of the same area, and found what looked like a pattern of waves washing across the ice, a huge area of ridges, a fingerprint pressed into the plateau. As Mark likes to say now, "It's like where God held up the Earth while he waited for the paint to dry." Dang, I wish I'd said that.

Months later, we had put together a lot more facts – the ridges had been seen before, many times, by pilots, and occasionally by the old trans-antarctic traversers; but like the blind men and the elephant, each had a piece of the puzzle, and the true beast was a sum of many features. The satellite image maps revealed just how widespread they were – not just near Vostok, but also in a good-sized area inland from Halley Station, and scattered patches throughout the area near Pole. They were subtle; 3 to 6 meters high, but up to 6.4 km from crest to crest. Most of the time, a ground-based traverse would report only patches of huge sastrugi, one meter or more high, mixed with flatter areas where the original snow was gone, and in its place were giant cup-shaped crystals the size of a fingertip. That, and a vague sense that they were in 'rolling terrain.' From the air, they look more like stripes, wind-roughened snow with old flat firn in between. They were only seen in areas where katabatic winds dominated the weather – where there were no other winds. And then, in a review of Landsat images covering the entire continent, we found that someone (Sir Charles Swithinbank, a legendary British glaciologist) had named them: megadunes. A place where the Earth behaves very oddly. We knew we had something good, and new – even Sir Charles' write-up had been just a few paragraphs – and we submitted a proposal to the National Science Foundation to study them.

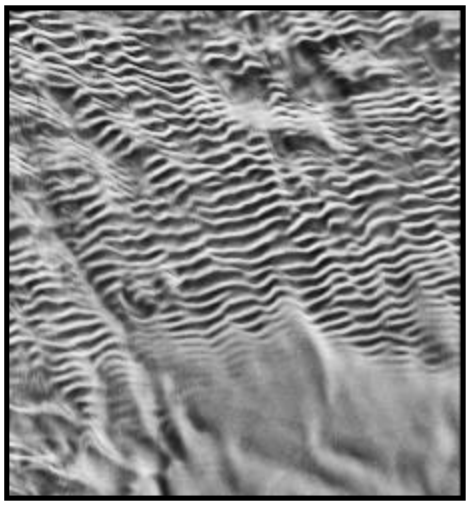


Image provided by Ted Scambos

Katabatic fingerprint: satellite image of the megadunes near Vostok (160 by 160 km).

We set out to explore the features last year… and got a good taste of what "the edge of the known world" really means. Minus 1 C temperatures, 35 kph winds, altitude, blowing snow: doing something new and different on this continent means taking your life in your hands. We came back this year, aiming for the best possible 'window' in the weather, in early January. A hardy bunch, armed with fan-augmented goggles, new boots, guitars, mandolins; we tried to block every possible hole our morale might leak out of. "Yeee-ha!" was our motto, a war cry of good cheer.

Slowly, we put together a few new pieces to the puzzle. Radar profiles showed that the dunes grow into the wind, and in the areas between the dunes, almost no snow sticks. Instead, the surface ages for centuries, forming giant cracks from the repeated thermal cycling of winter and summer, until the next dune downwind covers the old, glazed surface. The wind stays within 30 degrees of the same bearing, and cruises along at 45 kph for 10 months of the year, nonstop (Cape Dennison may see its title as windiest place slip). Because the snow gets so old, it gets coarse and porous; and so, air may flow right through the snow, moving the water isotopes and dust particles in ways that no ice core chemist ever counted on. With alternating bands of coarse old snow and new dunes, there are pockets deep in the snow where air a century old or more is trapped, providing a large reservoir for sampling to learn about levels of trace gases before technology tainted the atmosphere.

What do we learn when we study something new? If it's taxonomy, if it's as mundane as describing a new breed of gnat, the answer is, I guess, "not much." But if it is as new and challenging as megadunes, well, you learn about many things. The limits of your science. The limits of your imagination. The limits of your will. And I think you learn a little about the mind of God – about how magnificently complex and wonderful Nature is. Imagine: air so cold, it's thick; it actually slides off the continent, bouncing and sloshing as it goes. And over the centuries, at Megadunes, the Earth itself forms an image of the air, burned in from above, with waves marching slowly into the wind as the ice flows downhill. A truly spectacular "side show" resulting from the basic patterns of earth, air, sun, snow, and water that we accept as our home.

Yeee-ha. I love this planet.

Ted Scambos is a glaciologist at the University of Colorado Boulder National Snow & Ice Data Center.

around the continent

PALMER

Busy with science, visitors

By Kerry Kells
Palmer Station correspondent

January is proving to be a busy month for Palmer Station with birthdays, science lectures, cruise ships and yachts. We celebrated the birthdays of two members on Station, including our Area Director, Bob Farrell.

The researchers on board the *Gould* called from Rothera Station, our British neighbors far to the south.

And this past week we welcomed visitors from three yachts and two cruise ships to tour Palmer Station.

The yachts and cruise ships are a bi-weekly experience at Palmer Station during the month of January. Many of the yachts have sailed the Atlantic from Europe and made their way to the southern tip of Argentina to continue on to Antarctica. The cruise ships usually come from Ushuia, Argentina as well. The totals this season include seven cruise ship visits and seven yacht visits to Palmer Station with more to come in January and February.

From the double masted, 18-meter *Viahare*, to the small and cozy *Philos* to a catamaran with propeller and rudder problems, the *Double Magic*, yachts have cruised into Palmer Station throughout the month of January. The *Sarah W. Vorwerk* was the first yacht to visit at the end of December and will return in mid-February. Three yachts anchored in Hero Inlet this past week. First the *Viahare*, a yacht bought in Belgium with a French owner and Swiss passengers arrived on a stormy evening and toured station the next day. Then the *Pen Duick 6*, and the *St. Croix Paul II* arrived with the majority of passengers from France. All had 10 or more people on board, passengers and crew. In the world of the large cruise ships, the *Clipper Adventurer* was the first ship to visit. This past Wednesday was its second stop with 92 visitors. The *Endeavour* cruise ship was welcomed to Palmer Station again this past week. It has a strong history of professionalism and experience with Palmer Station visits.

The passengers on board are as interesting as the yachts and ships. Most of the yachts have European travelers; many are from Switzerland, France, and the Netherlands. The cruise ships tend to have predominately American passengers with representatives from the United Kingdom, Japan, South Africa and Canada. The make-up of the passengers can vary widely from yacht to yacht and ship to ship. The *Philos* captain, Erik, explains that everyone helps on board a yacht. Contrast this experience to that of the cruise ship, the *World*, a ship with condos for purchase on board. The 70 residents of the condos have the assistance of 270 crew, a choice of several restaurants, a small golf course, a swimming pool and a library to name a few of the amenities. But on the cruise ship *Endeavour*, which regularly invites the Palmer community on board, two passengers spoke about their previous seasons at McMurdo; one was a para-rescuer dog sled driver with the Navy and the other worked in cargo in the late 1980's.

Photo by Cara Sucher / Special to The Antarctic Sun

The private yacht Philos *and catamaran* Double Magic *sit at Hero Inlet near Palmer Station.*

Palmer Station continues our last two months of a busy summer season. Here on the peninsula, the Long Term Ecological Cruise finishes at the end of this month and the *Laurence M. Gould* returns to Punta Arenas, Chile early February. In mid-February we welcome Charles Amsler's group from the University of Alabama Birmingham to station to study the chemical ecology of Antarctic marine organisms. And by early April, Palmer Station's last summer crew will depart and the winter crew arrives. To all those staying for the winter season at all stations, we wish a healthy and safe winter experience!

SOUTH POLE

Pole films featured

By Peter Rejcek
South Pole Correspondent

Robert Falcon Scott learns one of his men on the famous and doomed 1911-12 journey to reach the South Pole first has a gangrenous hand. He's told the appendage will swell, blacken and eventually fall off.

The reaction from the hardy adventurer: "Yuk."

Polar history and everyday life at the bottom of the world got turned upside down at the South Pole's first annual film festival last Saturday night in the new galley. Polies turned their cameras on themselves — as well as common kitchen condiments. The results were usually funny, sometimes surreal but always interesting.

"It was great. It was awesome. It was better than I ever expected," chief festival organizer Brian Land said of the event. Land also directed "The Frozen Dead," one of the 10 local films showcased. Other filmmakers included Tom Pi, Mike Boyce, Tyler Regan, Holly Carlson, Dave Carlson, Joe Speidel, Keros Johnson and Jack Giacalone.

The short films were as varied as anything playing at the Sundance Film Festival, which just finished its run in Park City, Utah, Jan. 25.

Regan light-heartedly skewered Scott's epic adventure in "Nova-Terrable," a parody of Ted Tally's play "Terra Nova" about the ill-fated expedition. Starring the square-jawed Kris Perry as Scott, the movie lampooned station life and included a cameo appearance by station manager B.K. Grant, who after hearing Scott's tale of woe tells him, "It's a harsh continent."

In "Surf's Up" Regan mixed excellent cinematography and a surfer dude catching some killer sastrugi waves to a Beach Boy's tune.

In another direction, a lascivious

See Continent on page 6

the week in weather

McMurdo Station
High: 30 F / 1 C Low: 9 F / -13 C
Wind: 29 mph / 47 kph
Windchill: -35 F / -37 C

Palmer Station
High: 46 F / 8 C Low: 30 F / -1 C
Wind: 52 mph / 83 kph
Windchill: 25 F / -4 C

South Pole Station
High:-11 F / -24 C Low:-29 F / -34 C
Wind: 22 mph / 35 kph
Highest physio-altitude: 3,179 m

Continent From page 5

bear-shaped bottle of honey is the star in Keros Johnson's film: "The Lost Condiment: An Epic Love Story."

Johnson, a dining assistant doing a year at Pole, started doing short films during his second winter at McMurdo. "We would do short films with no editing. They turned out pretty good, and it was a nice way to spend a Sunday."

He said there was no hidden message in his movie, just "a bear on search for some loving."

Jack Giacalone, who works as a surveyor here, submitted a pair of music videos.

Pi, a documentary filmmaker who produces a video about South Pole every year, also had a couple entries at the festival. He and fellow carpenter Mike Boyce produced "Land's End," possibly the first film ever to be shot entirely in an outhouse. In "Egress 1830" Pi turns to the horror genre and the underground ice tunnels for inspiration.

The latter, he said, was his "intent to create a pure, uncliched horror film. The passages beneath the ice are perfect."

Dave Carlson's film drew big laughs for its two less-than-graceful ballerinas while Holly Carlson took an artistic approach, with her lone actress chasing a large, bright red balloon around station.

Speidel, using his own carpenter crew, did a twist on the usual scenario of a band of lusty construction workers whistling after a babe in Carhartts — only to find out that she is a he. Speidel, along with Ken Keenan, designed the T-shirt for the festival.

Two showings were held, including one to accommodate the swing shift. A martini and wine bar with wait staff lent an Oscar night feel to the event. Land said all participants will receive gift certificates at Christchurch, New Zealand, stores and restaurants.

SHIPS

Polar Star, Polar Sea

By LCMDR April Brown
McMurdo ship ops / Coast Guard liaison

Ship Ops tempo is very high, and the flurry of different vessels tying up and casting off from one day to the next is confusing at best. I'm even getting *Polar Star* and *Polar Sea* mixed up these days.

The end of the summer season is nigh, but lots of stuff still needs to happen before us summer folks can beat feet to warmer climes.

A U.S. Coast Guard icebreaker sits "parked" in the sea ice late last week near the seaside outlet of a channel leading to McMurdo Station.

Photo by Melanie Conner / Special to The Antarctic Sun

Speaking of weather, the cargo vessel *American Tern* is delayed due to bad weather, and the new estimated arrival time is 11 a.m. on Feb 5. Of course this is a weather delay, and as everyone who has ever flown down here knows, that is subject to a lot of change!

You may have seen the tour ship *Klebnikov* in the channel yesterday. No we didn't bring her in to do morale cruises, sorry. I wish I could say when, or if, the icebreakers will do morale cruises, but I can't.

The *Palmer* is scheduled to come in on Feb 17 or 18 for the final time. Hopefully by then the icebreakers will be gone and I can get some sleep.

I would like to announce that this will be my final season as "Mac Ship Ops" leader as I will be retiring from the Coast Guard this summer. I am saddened about not seeing you all next season. I have really felt a part of the family here and I will miss you terribly. Take good care.

And finally, at long last, the winner of my contest for when the *Polar Star* would first touch the ice pier this season is McKenzie Winters, who guessed closest at Jan. 5 at 12:59 PM. The actual time was Jan. 5 at 9:47 PM, that is when the *Polar Star* "hit" the pier (making a fine "v-shaped" boat launch if I don't say so myself).

Special thanks to April Brown for her contributions to the Sun this season and we wish you a very happy retirement. Signed, the Sun staff

Nathaniel B. Palmer

Compiled from reports by Ashley Lowe

The *Nathaniel B. Palmer* has been collecting seismic data in the Ross Sea. On Jan. 23 it stopped to drop off a shore party with a Zodiac at Franklin Island for the petrologists to collect rock samples. A small crew spent about four hours on shore, then returned to the ship.

The *Palmer* then returned to mapping the sea floor with swath bathymetry.

The night before, the ship dredged a small sea mount so that its composition could be compared to rocks gathered on shore.

The wind began blowing out of the south on Jan. 24.

"We are all keeping our fingers crossed that it will blow some of the ice out of McMurdo Sound and permit us to return to the original study area," wrote Marine Project Coordinator Ashley Lowe.

Laurence M. Gould

Compiled from reports by Andy Nunn

Between taking water samples and net tows for the Long Term Ecological Research cruise, the *Laurence M. Gould* stopped at the British station at Rothera last week.

Sustained 50-knot winds and high seas forced an overnight break in the sampling on Jan. 21. Two days later the *Gould* dropped off a field team at Avian Island. It landed the team and gear successfully in sheltered waters, with no sea swell, though the winds were 25 to 30 knots. The six-person landing party got very wet from sea spray on the ride in.

The next day, Jan. 24, was the scheduled visit at Rothera.

In the morning the *Gould* pulled alongside its dock and exchanged a group of 12 people via the personnel basket. The *Gould* departed to conduct joint science operations, while the shore party took a tour of the base. At 4 p.m. the *Gould* tied up for the evening and the rest of the crew went ashore for a celebration of "Burns Night" in honor of Scottish Poet Robert Burns. Haggis was served at dinner, and several poems were recited afterwards, most of which were odes to various aspects of Scottish culture and anatomy. Then the dining room was cleared for a Ceilidh (pronounced Kay-Lee) which is Scottish folk dancing. Almost everyone participated and the floor was soon filled with swirling kilt clad dancers, who managed roughly to keep time and follow the steps.

"Three Raytheon Polar Services people and myself had convinced the captain to allow us to cut up several old red plaid blankets and produce kilts of our own, so we felt right at home amongst the other celebrants," Nunn wrote.

Gateway cities welcome back Ice workers

By Kristan Hutchison
and Kris Kuenning
Sun staff

Anyone coming or going to the Antarctic must pass through one of a handful of gateway cities. In the U.S. Antarctic program, the exodus of austral summer workers from South Pole and McMurdo stations has begun funneling through Christchurch, New Zealand, before fanning out around the globe. Scientists, ship crew and Palmer station workers pass through Punta Arenas, Chile year round. And on occasion, a U.S. ship on its way to McMurdo Station ports in Hobart, Tasmania.

All three cities take pride in their recent and historical connections to the Antarctic.

Christchurch

Christchurch has a long history with Antarctic explorers, including being the final port call for Robert Falcon Scott. It is still the last stop for the majority of people in the U.S. Antarctic Program.

Often called the Garden City, its wealth of parks and gardens makes it a great place for people transitioning to or from the Ice. The extensive Botanic Gardens in the center of the city are a favorite hang-out for plant-starved Antarcticans. For more botanic pleasures, the Riccarton Bush is a rare little patch of original native forest outside the center of the city.

The Canterbury Museum on Rolleston Avenue has an extensive Antarctic collection. Many of the exhibits were donated by leaders of expeditions in recognition and thanks for the outstanding support provided by the museum. The displays include Amundsen's pocket knife and sledge, Shackleton's watch, a display of sledging dogs and the primus stove used on Shackleton's rescue boat from the *Endurance* expedition, the *James Caird*.

A little-known gem of Antarctic history is the Lyttelton History Museum. The volunteer-run museum on Gladstone Quay is curated by Baden Norris, who also curates the Antarctic portion of the Canterbury Museum. The Antarctic gallery is upstairs and includes, among other odd treasures, the taxidermied head of Scott's favorite dog, Deek.

The new Christchurch Art Gallery on Montreal Street has a small Antarctic Gallery for art inspired by the frozen continent.

Christchurch is a great place to start stocking an Antarctic library. Arnolds Books and Smiths Books are used bookstores with Antarctic sections. Mapworld on Gloucester Street has a wide selection of Antarctic maps.

In May, the *James Caird*, will be part of an exhibit at Te Papa museum in Wellington. The exhibit, called South, will run until September.

Christchurch weather can be unpredictable at any time of the year, but a warm day screams for ocean-front activity. Stroll along the endless, open Brighton Beach or traverse the sea cliffs beyond Taylor's Mistake. Surfboards and wetsuits can be rented in Sumner.

Nighttime is a novelty after a bright, Antarctic summer and so is nightlife beyond the three bars of McMurdo. Antarctic workers and scientists can almost always be found at Bailie's bar in Cathedral Square. Other recommended spots are Sammy's Jazz Review, with live music every night and Indochine on Cambridge Terrace, a "dining experience and cocktail gallery."

C1 café on High Street makes a mean espresso at the end of Christchurch's up-and-coming fashion district.

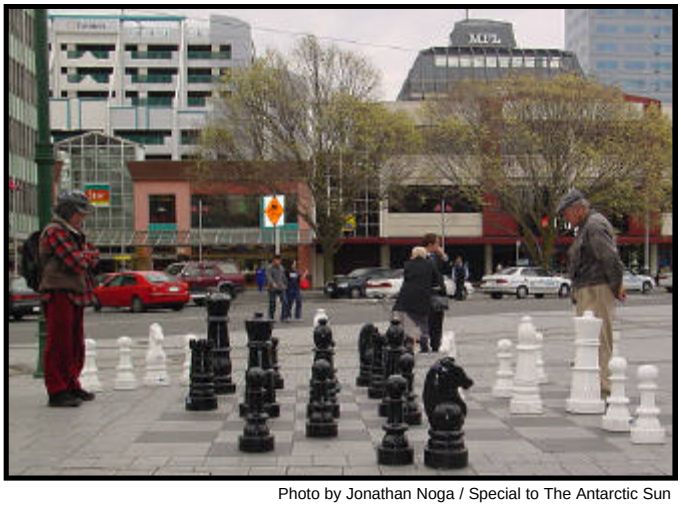


Photo by Jonathan Noga / Special to The Antarctic Sun

Men play chess in Cathedral Square in Christchurch, New Zealand, where many Antarctic workers are landing again this week.

Photo by Kristan Hutchison / The Antarctic Sun

A stuffed penguin dressed in Chilean garb stands in an antique shop window in Punta Arenas.

Punta Arenas

Chileans consider Punta Arenas, near the tip of South America, the center of their country. Their maps extend in a wedge all the way to the South Pole and a famous Chilean poem from 1554 equates the country with the Antarctic region.

"From that time the Spanish people who belong to the king say their country goes south 'til the end of the Earth,'" said Daniel Torres, chief scientist for the Chilean Antarctic Institute.

The U.S. doesn't recognize territorial claims to the Antarctic and in 1959 the Antarctic Treaty set all claims aside. Even so, the geographic closeness between Chile and the Antarctic peninsula make Punta Arenas a natural port for the U.S. Antarctic Program ships going to and from Palmer Station. Many cruise ships also set sail for Antarctic tours from the city on the Straits of Magellan. Before they cast off, tradition requires passengers and sailors to rub the toe at the base of a bronze statue of explorer Ferdinand Magellan. The superstition, dating back to the early 1900s, says the gesture will guarantee a safe return. The polished toe points toward the Chilean Antarctic Institute, the Chilean equivalent of the U.S. Antarctic Program.

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Gateways From page 7

Photo by Kristan Hutchison / The Antarctic Sun

The toe on the statue in the Puntas Arenas square is shiny from being rubbed by people setting sail for the Antarctic. Legend says rubbing the toe guarantees a safe return.

Local museums nearby give some of the region's history and natural history. Many people headed to or from the Antarctic are satisfied to just do as the locals do, and walk up and down the streets, admiring the tall, carved doors, many-colored houses and architecture inspired by Europe.

"A lot of what people do is get the Spanish 'paseo' (walk) going," said marine projects coordinator Skip Owens, who's been traveling through Punta Arenas for 20 years.

The square is a focal point of the town, with trees, flowers and a parade every Sunday at noon.

Afterward they gather again at favorite restaurants, including diner-style Lomit's for sandwiches or eggs with fresh avocado and the elegant Remezon del Calvo restaurant for garlic soup and the locally famous crab, called "centolla."

Owens has spent enough time in Punta Arenas to learn the local fishing holes and camping spots. He recommends a campsite a few hours south, toward Puerto Humbre. At the famous Torres del Paine visitors have a full spectrum of choices, from backcountry camping to a hotel. There's a day-use area called Laguna Parrillar and a ski area nearby called Las Nina Park.

It's not necessary to go all the way to Antarctica to see penguins either. At the right time of year, day tours are offered to nearby penguin colonies.

Hobart

Tens of millions of years ago, Hobart, Tasmania, was near Cape Adare, now 725 km from McMurdo Station. The hills above the Australian city are made of the same rock as the Transantarctic mountains.

Antarctica remains a prominent piece of Australia's national psyche. The $100 bill features Australian explorer Douglas Mawson and the country lays claim to several subantarctic islands and a slice of the mainland.

"It's like Australia in many ways," said Martin Betts, of the Australian Antarctic Division. "The middle of it's basically uninhabited, (with) the little populations around the coast."

Though Hobart is now 4,000 km away, the seaside town is still a convenient port for ships heading to Antarctica and has been since sealers and whalers used it in the 1800s. Often the US Coast Guard icebreakers or the research vessel *Nathaniel B. Palmer* stop in Hobart for three to four days to restock food and fuel on their way to or from McMurdo Station.

"Hobart's the logical stepping off point," said Johannes.

Hobart is closely tied to Antarctica, both in spirit and economy. The Australian Antarctic Division is a 20-minute drive from downtown. From 70 to 100 Tasmanian companies do business with the Australian Antarctic Program. Australia spends $100 million a year on goods and services for the Antarctic program, half of that in Tasmania. That's a significant contribution to Tasmania's Aus$11.5 billion gross annual production, said Lara Giddings, Tasmanian Parliamentary Secretary for Antarctic Affairs.

"It also puts us on the map internationally," Giddings said. "It provides some prestige to the state."

Tasmania has the highest ratio of scientists in Australia, with 65 percent of all Australian Antarctic scientists working in Hobart. Plus, about 200 scientists from around the world come to Hobart for the annual meeting of the Commission for the Conservation of Antarctic Marine Living Resources.

Hobart plays up its Antarctic connections to draw tourists. For the past four years, the Polar Network, an organization of about 60 companies with Antarctic links, has sponsored a Midwinter Festival in June to highlight the Antarctic ties. In 2002, the festival drew 26,000 people for film festivals, picnics with sled dogs, lectures and other activities.

The Antarctic Adventure in downtown Hobart is an educational amusement park, with a ski-run simulator, snow-filled cold room, planetarium, movies and a mockup of an Antarctic base camp. Computer games allow people to try their hand at field science, including counting seals from helicopters.

The Hobart Royal Tasmanian Botanical Garden has the only refrigerated greenhouse in the world, featuring plants from the subantarctic Macquarie Island. Kept from 2 C to 4 C, with fans and a fog maker, the greenhouse provides familiar conditions for 30 species.

"From a plant's point of view it's actually quite a comfortable environment, apart from the screaming winds," said senior horticulturist Mark Fountain.

The predominant plants are cabbages and grass, plus a couple fern. There is one unique orchid, which is kept in a box in the nursery.

"There's a whole suite of circumpolar plants," Fountain said.

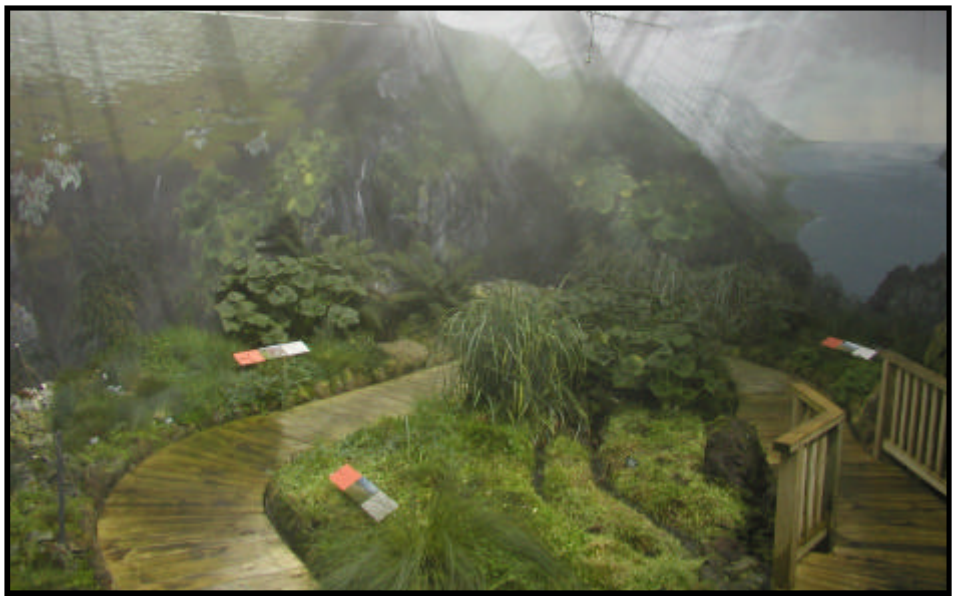

Photo by Mark Sabbatini / Special to The Antarctic Sun

Fog and wind are pumped into a refrigerated greenhouse at the Royal Botanical Gardens in Hobart, where plants from subantarctic islands grow.

Science toys key to finding out more

By Brien Barnett
Sun staff

From small GPS units tossed into a jacket pocket to cosmic ray detectors, modern-day science relies on technology.

Scientists these days almost have to have a scientific toy to take into the field with them. This year, Antarctic researchers brought to the Ice a host of gear to probe, measure or detect, some of their own design.

Cameras this season are being placed underwater, on icebergs, on Mount Erebus and with penguins.

Instrument developer Tony Hansen has been working with science teams to develop new tools to do research based on the scientists' needs and budgets, which are usually tight.

This year, he and a graduate student engineer worked on a submersible Webcam to monitor fish and other underwater flora and fauna in McMurdo Sound. Developing a case to hold the camera required multiple tests and changes in materials and structure before it proved successful enough to be used for research next year.

Among the coolest new instruments were small tubes containing accelerometers and cameras that were placed on Emperor penguins. The accelerometers helped the researchers learn more about the penguins' diving and swimming skills. The camera would have let them see it up close had it not come free during one of the bird's deep dives.

Japenese researcher Katsufumi Sato worked with principal investigator Paul Ponganis of the Scripps Institution of Oceanography at the "Penguin Ranch" near McMurdo this season. Sato spent many days watching the birds from above and using a low-tech pen to write notes, but planned to return to the lab and analyze the date from the accelerometers. The data will be incorporated into models that will help the researchers plan future experiments.

Miles away from the penguins on a slope of Mount Erebus, scientists installed an infrared camera that constantly monitors the crater of the active volcano. The video is transmitted to the Crary Lab in McMurdo and shows the steam and an occasional burp of magma.

Bill McIntosh of the New Mexico Bureau of Geology & Mineral Resources said by season's end his team will have set up six stations that feature GPS or global positioning systems, tilt meters, instruments to record temperature and the redness of the magma lake, and sample gas emitted by the volcano.

Photo by Brien Barnett / The Antarctic Sun

Jeff Blair and Tony Hansen of McGee Scientific, tighten the base of a submersible platform for a camera that will monitor underwater activities in McMurdo Sound.

The Erebus instruments use solar, wind and battery power to function. The instruments and related systems require money, though McIntosh said funding agencies generally expect technology to be part of grant requests. Sometimes researchers reverse the game, getting funding for instruments to do their science.

"There does seem to be a fair amount of money available for instrumentation," McIntosh said. "It's getting harder to get money for basic research, but you can do it by getting funding for new instrumentation."

Laurie Connell of the University of Maine is conducting research in the Dry Valleys. She also is using nanotechnology that will help her understand the complexities of the region. Her goal is to develop a hand-held device that will analyze and report what's in a sample without tainting it.

"The simpler we want to make things, the harder it is (to develop)," Connell said.

Current methods to analyze the microenvironment fall short of what Connell said she needs to fully understand how microorganisms adapt to or change their environment.

"There are questions we cannot answer with the current tools we have available," she said.

The pressure, Connell said, is to develop the technology quickly, though, much research and experimentation are required and funding can be difficult to obtain. The technology has to be tailored to the researcher's needs and can't be found in the open market in many cases.

"Nobody else is going to do it the way I want to do it," Connell said.

Space scientists know that first hand. The instruments that end up at Amundsen-Scott South Pole Station are unique and take years to conceive, test and build.

Among the projects planned are a giant 10-meter telescope to scan the depths of space and an expansion of a high-energy particle detector buried in the ice.

Last month, one of the biggest instruments was delivered to Pole. It will be used to drill holes in the ice that will hold the instruments the telescope will use to look for rare particles.

The giant hose reel had to be brought by airplane in pieces and assembled on the snow. The reel will hold the hoses that will be used to drill 2,000-meter holes in the polar plateau next season for a giant neutrino detector.

The spool was designed and built at the University of Wisconsin's PSL Engineering and Instrumentation lab. Technical Director Frashid Feyzi said the lab's group of about 12 engineers specializes in designing and building instruments nobody else can.

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From above and below, auroras in focus this winter

By Brien Barnett
Sun staff

The auroras over the South Pole will get extra attention this winter and in the coming years, thanks to a tag-team effort.

A high-resolution camera that monitors proton auroras was placed at Amundsen-Scott South Pole Station in January. Far above Earth's atmosphere the Imager for Magnetopause to Aurora Global Exploration, or IMAGE, satellite is focused on the southern hemisphere. Together, the two instruments may help scientists learn whether the mechanisms that create the auroras are steady or intermittent, said researcher Stephen Mende of the Space Sciences Laboratory at the University of California, Berkeley.

"What we are trying to do on a global scale is see if it's just a steady flow like a river from the Sun," Mende said.

That question would help Mende and others understand the processes that allow particles sent from the Sun to interact with molecules in the Earth's atmosphere. Besides auroras, energetic particles from the sun have been blamed for killing communications satellites, threatening astronauts and knocking power grids on the ground offline. Gaining an understanding of the processes would go a long way to developing technology to offset the effects of particle showers.

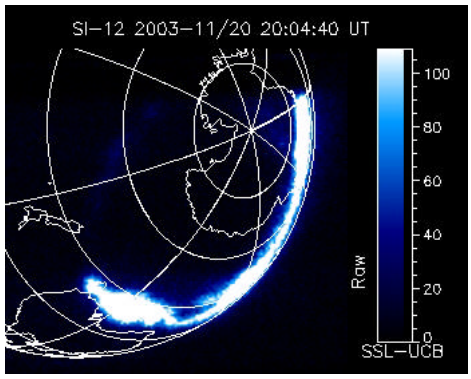

Image courtesy of IMAGE / Special to the Antarctic Sun

This data image from the Imager for Magnetopause-to-Aurora Global Exploration satellite shows an aurora over Antarctica, stretching to Australia, on Nov. 20, 2003.

The satellite already has been tracking auroras in the northern hemisphere from its orbital point roughly eight times the Earth's radius away. It provides global images of the particle showers which show up as haloes of light.

In a paper published in December in the journal *Nature*, researchers reported finding evidence that a particular part of space where the solar wind buffets Earth's magnetic fields – the magnetopause — may be where a steady stream of particles enter Earth's magnetic field. Mende said that might contradict other theories that the particles are sent to Earth in spurts similar to events seen after solar storms.

According to the paper, IMAGE and another satellite gathered data which showed the protons flowed from the sun to create the auroras over many hours. Those particles were "traced" back to the magnetopause where an event called reconnection occurs. In reconnection, magnetic field lines cancel each other out and the particles are able to exit the solar magnetic highway onto the Earth's magnetic paths.

Now Mende is looking for proof. This winter's surveillance represents the first year of the three-year project.

Launched in 2000, IMAGE studied auroras over the North Pole through 2002. The satellite has a useful life beyond the two-year goal of the project. Now, because of its highly elliptical orbit and angle of view, it is in position to monitor the southern hemisphere for the next two years.

"We had hoped that it was going to last a lot longer and so far it has," Mende said. "At the end of this year, and in 2005, we're in a good position to look at this hemisphere."

NSF funded research in this story:
Stephen B. Mende, University of California Berkeley

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"If it's available on the market, then somebody else has figured out how to do it cheaper and better," Feyzi said. "If it's out of the ordinary we'll do that."

He said the lab has seen a move toward bigger, stronger and "more capable" instruments that push the envelope of technology.

"Nobody's happy with yesterday's level of performance," Feyzi said about the science and technology communities in general. "They're always looking for more accurate, better devices."

If that's the trend, then one of this year's long-duration balloon experiments fits the category and shows how one type of technology requires even more technology.

A balloon-borne project this year was a set of instruments called TRACER which cost about $10 million.

TRACER skimmed along the top of the atmosphere to search for energetic particles from outer space. High-tech balloons got it there. The super-thin helium-filled balloons expand to the size of a football stadium and cost tens of thousands of dollars each. Scientists kept in touch with and tracked TRACER via satellites, and used solar panels and a special rotator to power it.

If TRACER was the big-bucks instrument of the season, Adelie penguin researcher David Ainley's "geolocation" tags were an ultra-low tech, low-cost opposite. The little tags sense sunlight and store tidbits of data to determine where the birds spend their winter. Each tag cost only about $150 and has already shown that the birds migrate farther than expected.

Science is asking more complicated questions than before and the need for more accurate and specialized technology seems destined to continue.

"As far as theoretical science is concerned, Aristotle thought women had fewer teeth in their head but nobody ever bothered to open their mouth and check," said Bob Morse, who heads a telescope project at South Pole. "Without instrumention it's just theory."

Photo by Brien Barnett / The Antarctic Sun

In a hut at the Penguin Ranch near McMurdo Station, Katsufumi Sato holds an accelerometer that records penguin dives and allows him to learn more about how they feed and swim without getting the "bends" like humans do.

Coastal collaboration

Joint research team studies ecosystem along latitudinal line

Glen Fenton drills an ice core as a group of Adelies pass by.

Photo by Ken Ryan / Special to The Antarctic Sun

By Kris Kuenning
Sun staff

A 15-year, interdisciplinary, multinational project was launched along the Ross Sea coastline this year.

The Latitudinal Gradient Project (LGP) will put together a picture of how the ecosystems along the Victoria Land coast differ from north to south.

Cape Hallett, 600 km north of McMurdo, was one of five planned research camps that will extend to the Beardmore Glacier.

Antarctica New Zealand is providing the logistical support for the project, which brought six U.S. scientists and 16 Kiwis to Cape Hallett this season.

Like the Long Term Ecological Research projects in the Dry Valleys and at Palmer Station, the Latitudinal Gradient Project aims to look at all the pieces of the ecosystem - from marine and terrestrial biology to soil properties – to learn how the whole system responds to climate changes.

"In the Dry Valleys we are looking at the variability in ecological processes over time," said soil researcher Jeb Barrett from Dartmouth University. "Here we'll look at the variability over space. We can compare what we've learned in the Dry Valleys about what influences biodiversity and ecological processes."

Researcher Diana Wall from the University of Colorado describes Cape Hallett as the richest botanical site in Victoria Land. Warmer temperatures and more water allow the growth of more lichens and mosses, which in turn put more carbon and nitrogen into the area for other organisms.

"Cape Hallett is the link between the Dry Valleys and the rest of the world," said Ian Hawes from the National Institute of Water and Atmospheric Research in New Zealand. "From there we can start to extrapolate further."

In 1957, a joint U.S.-New Zealand research station was established at Cape Hallett. Back then, environmental protection standards were nothing like they are now. As a result, the decision was made to build the station within a penguin rookery. More than 7,500 penguins were evicted from their nesting sites. By 1968, the penguin numbers had dropped by 60 percent.

Megan Balks from the University of Waikato in New Zealand studies the affects of human impact on soil environments. She is working with Jackie Aislabie of Landcare Research to determine the extent of hydrocarbon spills left over from the old station. In addition, her work includes general soil mapping and characterization.

Hawes said the basic collection of information would form a hanging framework for the Latitudinal Gradient Project.

"Hanging off this framework are a lot of individual projects that put flesh on the framework," Hawes said.

Hawes studies aquatic systems and in this case will be looking at the availability of water on land. This year, he will focus on the diversity of life in the flowing streams around Cape Hallett.

Compared to the Dry Valleys, Hawes said the Cape Hallett region receives more snow.

"That means more snow melt and more potential for things to grow," he said.

Researchers expect to find that differences in temperature and moisture along the gradient have a measurable impact on how much life exists in each of the project's sampling areas.

For the U.S. researchers, the four days at Cape Hallett this season ended up being mostly reconnaissance, with some sam-

See LGP on page 12

Photo by Gus McAllister / Special to The Antarctic Sun

Mary Sewell and Jen Jury from Aukland University look at plankton samples.

LGP

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pling done from a nearby vale. In future seasons, Barrett and Ross Virginia from Dartmouth will look for life in the soils, first by measuring how much they breathe.

"Soils breathe in oxygen and exhale carbon dioxide. We can measure the activity in the soil by measuring the amount of carbon dioxide given off."

The Dartmouth researchers will also set up soil warming cones, which work like mini-greenhouses to heat up a patch of soil to see how increased heat affects the number and type of things growing. The soil warming cones will be left over a winter and a range of samples will be brought back for chemical analysis.

"No one has been at Hallett with modern sampling techniques," Virginia said.

Dry Valleys researcher Diana Wall is interested in how the greater diversity in plant and animal life affects the movement of carbon and nitrogen in the ecosystem and vice versa.

Offshore, Ken Ryan from Victoria University in Wellington, New Zealand, looked at algae growing under the sea ice in December.

"We established five sites at different points around the Cape Hallett peninsula and collected samples of algae from the ice at regular intervals," Ryan said.

He also checked the salinity, temperature and chlorophyll concentration in the water beneath the ice and took algae samples from the sea floor.

Ryan used fluorescent instruments to see how efficiently algae in the area were converting sunlight to energy. This is the first time these techniques have been used on sea ice algae, he said.

At the ice edge, only 5 to 7 km away, Mary Sewell from Auckland University, was conducting plankton trawls.

From several places in between, Craig Marshall of the University of Otago in New Zealand, was busy catching 812 fish to collect tiny pieces of their fins. There are more than 100 notethenoid species in Antarctica. This diversity is unusual, compared to the rest of the world, Marshall said.

"There are notethenoid in New Zealand and South America but there are just a handful of species, probably 15 all together," he said.

Researchers believe the 100 species probably developed from just one or a few ancestral fish species over the last 15 million to 20 million years.

"Which is a relatively short time from an evolutionary perspective," Marshall said. He wants to know how similar the species at Cape Hallett are to the ones found in McMurdo Sound and how the climate has driven the evolution.

The Cape Hallett camp will run again next year. After a year off in 2005-2006, the plan is to set up a camp at the Darwin Glacier or in the Terra Nova Bay area.

The collaborative project gives researchers an opportunity to share ideas, logistical support and sometimes even instrument space. Balks will attach a moisture monitor to one of Hawes' climate stations. Hawes is adding sensors on another project's data logging station.

"Getting scientists to work together can be like trying to round up chooks (chickens)," Hawes said.

But consolidating all the disciplines into one camp is not only efficient from a logistical point of view, it also gives researchers an opportunity to share their complementary knowledge.

Diana Wall said most of the researchers' interests overlap and their knowledge is complementary. "That time in the field is invaluable," she said.

NSF funded research mentioned in this story: Diana Wall, University of Colorado and Ross Virginia, Dartmouth University.

Photo by Ken Ryan / Special to The Antarctic Sun

Craig Marshall and Dave Todd fish for notethenoid near Cape Hallett.

Drilling back to the future

By Kristan Hutchison
Sun staff

The muck below McMurdo Sound and the Ross Sea holds millions of years of submerged history.

An ambitious new multinational project plans to dig up the murky past, back through the fluctuations of the glaciers. Researchers from the U.S., New Zealand, Britain, Germany and Italy plan to use a new drilling system to bring up sediment cores from 2,000 meters below the ice or water surface, deeper than ever before in this area. The researchers anticipate the deep cores will contain fossils and sediment left behind by advances and retreats of the ice sheet and volcanic debris going back 65 million years.

"Going into the past to times in Earth's history when the Earth has been warmer may be a means to understand our potential global scenarios under a warmer than present Earth," said David Harwood, a leading principal investigator on the Antarctic Drilling, or Andrill, project. "The past is going to be our guide to the future, in terms of magnitude of change and speed of change."

Already three years in development, Andrill is projected to last for at least 10 years. So far the five-nation oversight committee has agreed to develop plans for two of five proposed drilling sites in McMurdo Sound. In December they outlined a plan for funding for the $7 million Andrill operations and management budget. The U.S. National Science Foundation offered to cover half the operations budget. New Zealand offered to contribute 25 percent, and be the main project operator. The rest of the funding is expected to come from Italy (18.5 percent) and Germany (5 percent).

"The level of U.S. involvement is tied to the level of U.S. scientific interest in this work," said Scott Borg, NSF head of Antarctic sciences, "and to the desire of NSF to facilitate U.S. leadership in international projects."

"This project offers tremendous opportunity to obtain and study sediment records from key intervals of Earth history that will provide information about oceanographic conditions and the extent of glacial and sea ice."

So far, the NSF awarded nearly $1 million to Northern Illinois University and the University of Nebraska at Lincoln to purchase a state-of-the-art drilling rig and customize it for use in Antarctica. Andrill builds on four previous drilling projects in the Ross Sea region, starting in the early 1970s. The new system will drill two to three times faster than its predecessor, one used for the Cape Roberts Drilling Project from 1997 to 1999. While the previous generation of drills could only be used on the sea ice, the new drill will be able to drill through the ice shelf. The Cape Roberts drill went to about 1,200 meters below the water surface, as deep as the technology of the time could go.

"We're basically doubling that now," said geologist Ross Powell from Northern Illinois University and a principal investigator for Andrill. "In terms of the drilling that's been done in McMurdo Sound before, this is certainly the biggest operation because of the new drilling equipment that's been committed to and the potential longevity of the program that we hope is going to come from this."

Photo courtesy of Ross Powell

"We hope to retrieve data that will help us understand how changes may occur in Antarctica during future global warming and also give us insight into what the world may be like as global warming continues."

- Ross Powell

Deeper doesn't always mean older, because of the way the sediment can fold and thrust up older layers of sediment from below. The Cape Roberts project looked back 30 million years to the origins of the ice sheet, while the first two sites Andrill plans to target will look from 15 million years ago to the present.

"We got what we wanted (at Cape Roberts), but it was a different set of questions, a different time interval," Harwood said. "The Antarctic ice sheet has changed its character through time, being warmer and wetter in the past and now very cold and dry."

The drilling isn't planned to start until October 2005, when it will bring about 40 scientists, drillers and support workers to the McMurdo area. A geophysical survey is underway to prepare for Andrill. The first two sites to be drilled would be at Windless Bight near the runway and on the southwestern side of McMurdo Sound, Powell said.

At Windless Bight, the hole will be drilled 1,000 m into a 1,200 m-thick body of sediment near the runway. The goal is to pull up a piece of the Pleistocene era.

"We're hoping to go back a million-plus years in time with that section," Powell said.

The location appears to have one of the thickest known Pleistocene layers, because the volcanoes on Ross Island have weighed the Earth's crust down in that area creating a deep moat around the island that collected sediment, Powell said. The thick layer of sediment may include a detailed record of the fluctuations of the Ross Ice Shelf through the Pleistocene, before the record of atmospheric conditions acquired from the inland ice cores taken at Vostok and Epica near Dome C. From the Ross Ice Shelf fluctuations the researchers would get an idea what the West Antarctic Ice Sheet was doing.

The second site would drill from an ice platform at the intersection of two seismic lines east of New Harbor in Southern McMurdo Sound. The goal is to bring up rock from even further back, in the Miocene and Pliocene eras. Few spots in McMurdo Sound have Miocene rock because of erosion, so this would be the first sample of that age actually retrieved from the area.

"We're targeting intervals that have not been recovered previously in the earlier drilling records, so we're hoping to provide a more complete time record," Powell said.

The fluctuations of the Antarctic ice sheet reach far beyond the Antarctic Circle, and should tell researchers about global climate history. For most of the past 35 million years, the Antarctic ice sheet has been the largest piece of ice in the world, and locked up a large portion of the water. Melting and reforming the Antarctic ice sheet

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Andrill

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would change the sea level, Powell said.

"We also believe the Antarctic ice sheet has played an important role in controlling more recent climactic changes and certainly influences atmospheric and ocean circulation that has repercussions for what happens in the rest of the world," Powell said.

The ice shelves are sources of some of the ocean's deep water, expelling colder, saltier water as they freeze. That heavier water sinks and flows north, driving the rate of ocean mixing, oxygen exchange and circulation. The size of the ice sheet also influences how much sunlight is reflected, and therefore the temperature of Earth.

The records found in the mud will be combined with existing data and used with computer models of the climate, ocean, glaciers and tectonics in order to understand how the frozen Antarctic interacts with global environmental change. Researchers will compare the Antarctic data with records of environmental change from other latitudes. The cores will also provide evidence of the ancient changes in topography, soil movement and the tectonic stresses acting on the Earth's crust in the Antarctic.

The researchers hope the core will provide a detailed record, allowing them to pinpoint when significant changes occurred to within several thousand years. Looking back at a period in time when the world was much warmer may also give scientists an idea of what's to come. The Intergovernmental Panel on Climate Change (IPCC) has projected a rise in global temperature, mostly because of greenhouse warming, of between 1.4 C and 5.8 C by the end of this century. Continued global warming would have major consequences on agriculture and energy usage. Additionally, the medical community is concerned about the spread of disease associated with tropical areas, Powell said. Rising sea level could impact coastal cities from Venice, Italy to New Orleans.

"We hope to retrieve data that will help us understand how changes may occur in Antarctica during future global warming and also give us insight into what the world may be like as global warming continues," Powell said. "If the IPCC projections of warming trends are correct, the world's climate within the next few centuries will be at a point equivalent to conditions on Earth tens of millions of years ago, before Antarctica became cold enough to support the big ice sheets that are there today, and which have survived for over 35 million years."

If the project goes forward as planned, after the first two McMurdo sites are drilled, three other locations in the McMurdo area have been proposed for drilling. Then the project would move on to another region, Powell said.

"We hope this will be an ongoing facility that Joe Scientist can use in Antarctic research in years to come."

For more information on Andrill: http://andrill-server.unl.edu/

Tectonics

From page 1

era, referred to as an icehouse Earth, when the ice sheets formed over Antarctica and Greenland, and ultimately North America and Europe.

Researchers suspect these climate changes started in Antarctica, in part as a result of Antarctica's plate movements.

By studying the Ross Sea floor's natural record of tectonic and climate history, Luyendyk and others want to know what happened in Antarctica 30 million years ago.

Today, Antarctica seems to be contained on a single tectonic plate, but a deep trough in the sea floor northwest of the Ross Sea off Cape Adare suggests past movement between East and West Antarctica. Studies of the geological histories of East and West Antarctica show that the two sub- continents evolved in a similar fashion in the Cretaceous era (144 million to 65 million years ago) but then diverged with the advent of the Cenozoic.

Looking for more signs of movement between East and West Antarctica, Luyendyk, along with Doug Wilson of the University of California, Santa Barbara and Lou Bartek of the University of North Carolina, Chapel Hill, have been surveying new territory in the Ross Sea this year from the ice strengthened research vessel Nathaniel B Palmer.

When an iceberg named B15 broke off the Ross Ice Shelf in 2000, it exposed 16,000 square kilometers of previously unmapped sea floor. Last year, the researchers intended to survey that area but thick sea ice prevented access.

Photo by B. Luyendyk / Special to The Antarctic Sun

Research icebreaker Nathaniel B. Palmer *at the ice edge north of McMurdo Station, seen from a Coast Guard helicopter.*

Luckily, another large iceberg, C19, had broken into the sea in 2002 and the Palmer was able to traverse the newly exposed area. This year, the sea ice opened up and the hole left by B15 was surveyed.

Multiple sonar beams were used to map the topography of the sea floor. The multibeam technology allows a wide area to be surveyed with each pass.

"It's like mapping with a push broom," Luyendyk said.

At the same time, other instruments scan for changes in the magnetic and gravitational field along the ship's path. Changes in these fields indicate differences in the type of rock at and below the sea floor.

Finally, with what Luyendyk describes as the "most ambitious" technology, the seismic reflection method is used to map the structure of the earth beneath the sea floor. Seismic beams give a detailed look at the seafloor, pierce through the sediment layers, which can be up to 14 km deep, to map the crustal layer below, known as basement.

In the future, the researchers hope to compare the survey information with core samples of the sediment.

"In the sediment of the Ross Sea is a record of the ice sheets plowing and retreating over the sea floor," Luyendyk said.

Ship-based core drilling is very difficult in Antarctica. Land or ice-based drilling equipment needs solid ice to work from so researchers are waiting for the Ross Ice Shelf to advance northward over the recently surveyed areas. With the ice moving as much as 1 km per year, the drilling sites they surveyed should be ice covered again in two to five years. Luyendyk hopes to be able to work with the Antarctic Drilling Program (ANDRILL) to have several sites drilled.

Through this year's survey work, the team has pinpointed specific drilling sites.

"Some spots are winners," Luyendyk said. The drilling will target sediment where both the ancient plate tectonic history and relatively young climate history can be examined.

NSF funded research in this story: Bruce Luyendyk, University of California, Santa Barbara. http://www.geol.ucsb.edu/faculty/luyendyk

Random glance spots volcanic record

By Kris Kuenning
Sun staff

In the ice around Mount Moulton, volcanic ash marks time like plots on a graph.

The ash once spewed from Mount Berlin, 30 kilometers away.

Researchers were studying the volcano in 1993, and they went looking for places to collect rock samples from nearby mountains. Some of the only exposed rock in the area was on Mount Moulton.

Tired and dazed at the time, Nelia Dunbar was staring out a window on the plane.

"I was in back spacing out, staring at the ice when I saw these dark bands. They really stood out and I realized right away that it was ash," said Dunbar, a researcher from New Mexico Tech.

The plane landed and the researchers ran down the hillside to the ash layers. They had just enough time to take five samples. One of them turned out to be almost half a million years old. It was enough, Dunbar said, to know that they wanted to come back and do more research in that area.

The ice in West Antarctica is on a slow march to the coast. Most of the ice older than 117,000 years has already dropped into the sea, but at Mount Moulton the rocky buttress not only has halted the flow, it also has pushed the layers of ice and ash to the surface. Like a stack of papers, the layers have folded up in front of the rock, exposing the layers of ash in horizontal stripes.

The history of the volcano and the climate have been laid bare on the surface, exposing ice that dates from 15,000 to 492,000 years ago.

"You take a few steps, and you've gone several thousand years," said driller Trevor Popp from the University of Colorado, Boulder.

In 1999, Dunbar received a National Science Foundation grant to take ice samples and carry out GPS mapping of the site. This year, ice core drilling at the site will help piece together the climate history of the past 500,000 years.

Dunbar first used the ash layers to look back at the history of volcanic eruptions in Marie Byrd Land. Mount Berlin, though still steaming, no longer plumes and its lava lake has cooled, but the ash layers document a long history of explosive eruptions.

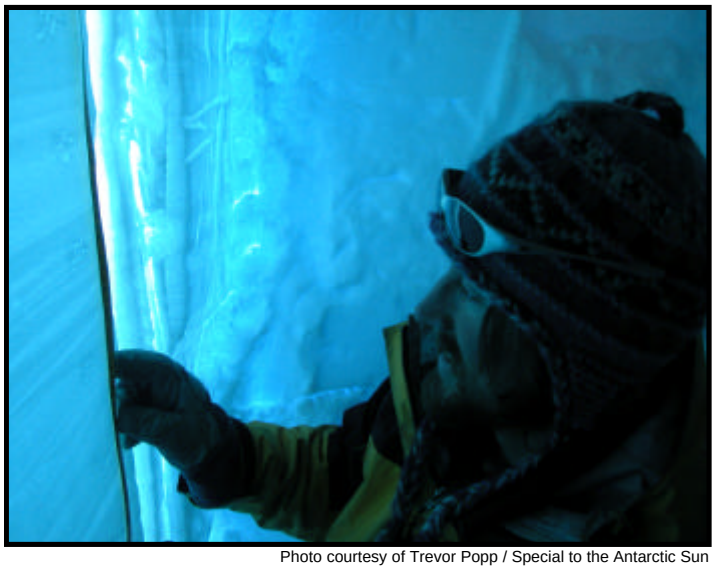

Photo courtesy of Trevor Popp / Special to the Antarctic Sun

Trevor Popp examines snow layers in a two meter deep snow pit near the summit of Mount Moulton. The layers are compressed and buried as snow accumulates, containing information that allows reconstruction of the past climate history.

"Mount Berlin last erupted 30,000 years ago," said Bill McIntosh. The eruptions showered ash all over Antarctica. Mount Moulton, being downwind of the volcano, was sometimes coated with 15 cm deposits.

The accumulation included course feldspar crystals up to 3 cm across. "There were big pieces of pumice raining down," McIntosh said.

He said the crystals, which are similar to Erebus crystals, are ideal for dating because they contain a high level of potassium.

With dates assigned to the ash layers, the climate history locked in the ice can be put into a more accurate timeline.

The information is also correlated to ash layers in ice cores from other areas, like Vostok or Siple Dome, where only tiny specks of ash are found.

"It can be difficult in ice cores to get the time," McIntosh said.

The ice cores from Mount Moulton will go to the U.S. by ship. From the port in California, a freezer truck will carry them across the desert to Boulder, Colorado, with a back-up freezer truck following.

In the lab at the University of Colorado, Popp will look at the hydrogen isotopes in the ice. Hydrogen atoms have varying numbers of neutrons. The varying combinations are called isotopes.

"Depending on the temperature of the air when the snow fell, there are varying ratios of heavy to light isotopes," Popp said.

In colder weather, there are fewer heavy isotopes. Other chemicals in the ice provide information about the sea levels or the amount of wind and airborne aerosols.

"Going back, you can see large climate fluctuations," he said.

Popp said the climate history at Mount Moulton looks very similar to that seen in other Antarctic cores, but not exactly.

"The differences could be due to climate changes between West and East Antarctic or problems with ice itself," he said.

Repeated sampling should help scientists determine if the anomalies are in the climate or in the record.

NSF funded research in this story: Todd Sowers, Pennsylvania State University

Moultonized

After a five-week delay, including one LC-130 aircraft parked overnight with damaged nose gear, the Mount Moulton team finally set up camp in mid-December.

The term "Moultonized" was coined to mean "delayed" or "suffering from unbelievable bad luck."

Once established the camp ran smoothly, apart from a few bouts of bad weather. Just before the camp was preparing to listen to Christmas carols across the high frequency radio, a storm blew through, generating enough static electricity to fry the radio and a solar panel. Until its return in mid-January, the team used Iridium satellite phones to communicate with McMurdo's communication center.

In one night, the camp population went from five to 19, when an LC-130 crew and the next installment of researchers were trapped overnight by weather, along with the crew of a Twin Otter. A meal of steak and scallops was prepared and the departing researchers said they enjoyed the company, their first human contact in five weeks.

Getting out of the camp proved easier than getting in, but was still delayed by almost a week.

Fishing

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along with many seabirds. In the Prince Edward Islands south of South Africa, intensive illegal fishing for toothfish has already depleted the population to a few percent of its pre-exploitation level, according to research published by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR). Other CCAMLR research found the toothfish population around Heard Island has also dropped since 1998.

"CCAMLR is pretty unique in that research drives it," said Rennie Holt, chairman of the organization's scientific committee. "As a whole, the commission follows the advice offered by the scientific committee."

The 24-nation commission was formed in 1982 to conserve marine life of the Southern Ocean within the Antarctic Convergence zone. The National Science Foundation and National Oceanic and Atmospheric Administration support studies that help CCAMLR manage the Antarctic fisheries, by keeping track of changes in the krill, penguin, seal and other populations.

"We're responsible for managing 12 percent of the world's ocean surface," said Denzil Miller, the Executive Secretary of CCAMLR. "It's pretty daunting, given the weather conditions."

Pirate fishing

CCAMLR oversees the Southern Ocean fisheries from a single-story brick building in Hobart, Tasmania, without a view of the water or a boat. Enforcement is up to individual countries involved in the treaty, who are limited within the Antarctic convergence to taking action against ships from their own countries.

"There's very little enforcement," said Michael Stoddard, chief scientist for the Australian Antarctic Division. "It's a very remote and bleak part of the world."

CCAMLR scientific committee estimates 10,175 tons of toothfish were taken illegally in the 2002-03 season from the area it oversees, according to Holt. An additional 8,744 tons were poached from zones covered by CCAMLR, but belonging to Australia, France, South Africa or other nations. Another 10,175 tons were reportedly caught on the high seas, but may have been poached from Antarctic waters.

"There is probably double counting, in that a good part of the high seas reported catch is in fact illegally caught toothfish caught in the convention area," Holt said. In response, last year the U.S. banned toothfish caught from the two most suspect areas on the high seas, area 51 and 57.

The illegal fishery is driven by greed,

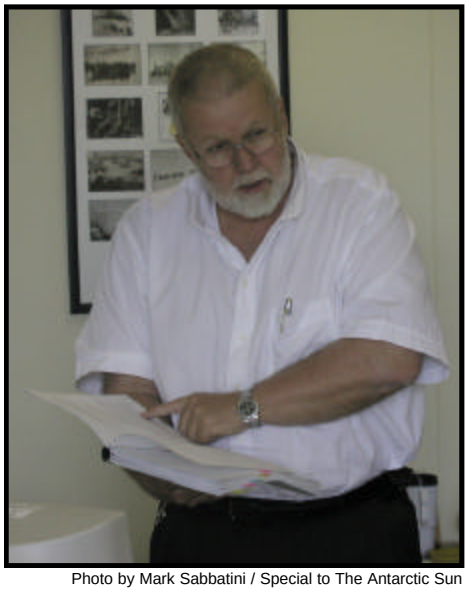

Photo by Mark Sabbatini / Special to The Antarctic Sun

Executive Secretary Denzil Miller refers to a report by the Commission for the Conservation of Antarctic Marine Living Resources.

Miller said. Toothfish is known to scientists as *Dissostichus eleginoides* or *Dissostichus mawsoni*. But it's served under many names around the world: sea bass, Chilean sea bass, Antarctic or Australian sea bass, Chilean grouper and black hake, mero, bacalao de profundidad, merluza negra, Légine Austral.

Last week, frozen toothfish was selling at $15 a pound, according to the report of weekly frozen New York wholesale prices. Fresh salmon was selling for $2.50 a pound. The value of toothfish sold to the U.S. last year totaled $103 million,

Photo by Kris Kuenning / The Antarctic Sun

Researcher Art Devries, left, and Kevin Hoefling, kneeling, weigh a mawsoni caught for research in McMurdo Sound.

according to the National Marine Fisheries Service (NMFS). From 50 to 60 dealers supply the fish, said Kim Dawson, NMFS fisheries biologist and catch documentation scheme officer. Legal U.S. imports account for about 15 to 20 percent of the world market for Chilean sea bass. Japan is the other large market for the fish, followed by the U.K. and China.

High-class restaurants in New York charge almost $30 a plate for sea bass and diners are willing to pay. The meat has a subtle and versatile flavor, a little like lobster. The firm flesh flakes into bite-sized pieces, each one creamy and smooth.

"Provided there's a stock that is economically attractive and provided there's a way to sell, unregulated fishing will continue," Miller said.

The profits are high, but the unseen costs of toothfish fishing may be even higher. Toothfish grow slowly and do not breed until they are at least 10 years old, so many fish are harvested before they've had a chance to breed. They live for up to 50 years and can reach more than two meters in length, but in the South African zone around Prince Edward Islands, the average toothfish caught is now below 55 cm long, meaning most of the fish are prepubescent.

"They catch a substantial number that probably haven't reproduced yet," said Art Devries, a researcher who has studied *Dissostichus mawsoni* in McMurdo Sound for more than 40 years. "The catching is pretty indiscriminate. Anything that gets hooked, regardless if they throw them back, is not going to survive."

Toothfish are a favorite meal for Weddell seals, sperm whales and elephant seals, so depleting the toothfish population could leave the whales and seals hungry.

Careless illegal fishermen also kill thousands of albatross, giant petrel, white-chinned petrels and other seabirds each year, when the birds swallow the baited hooks and drown. Seabird researcher Heidi Geisz, who works with the NSF supported Long Term Ecological Research program out of Palmer Station, has found fish hooks in the bird nests. The numbers are difficult to estimate because the amount of illegal fishing isn't known, but a CCAMLR working group calculated illegal fishing fleets may have killed from 14,400 to 46,950 seabirds in 2003.

"This kind of behavior is actually a crime to the environment," Miller said.

The crew on illegal fishing boats are endangered too, since the vessels are often old and work outside safety and labor laws. At least three to four vessels are

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known to have disappeared in the last four years, taking about 100 people with them, Miller said.

"The human cost is high, with old vessels in the worst maritime conditions anywhere, except the high arctic," Miller said. "There's a lack of responsibility and accountability, a ruthlessness and inhumanity."

Even legal fishing can be dangerous in tumultuous Antarctic waters, as was demonstrated Friday when the U.S. Antarctic Program was called on to help medivac a man hurt on a fishing boat in the Ross Sea. The chief engineer on the Russian ship *Volna* sustained a head injury and was unconscious. The *Volna* was fishing under a CCAMLR license 580 km from McMurdo Station and had a doctor on board.

The pirate fishing boats are part of a well-organized enterprise with alleged connections in Spain, Norway, Indonesia and China.

"The connections are very difficult to track. They're dummy companies within dummy companies within dummy companies," Miller said. "This is a well organized, well-structured endeavor."

The legitimate fishermen became so frustrated, 30 companies banded together to fight back against what they consider an organized crime network. The Coalition of Legal Toothfish Operators (COLTO) offers a $100,000 reward for information leading to the conviction of an illegal fishing operator, and has toll free numbers in 15 countries and six languages. COLTO publishes a "Rogues Gallery" listing 42 fishing vessels it believes are involved with illegal fishing. The legal boats occasionally run into the illegal ones on the fishing grounds, where they take photos and video to report the crime to authorities. They've even considered carrying weapons to take enforcement into their own hands.

Several environmental organizations, including Greenpeace, have called for a complete halt to fishing in Antarctic waters.

Placing a moratorium on fishing wouldn't stop the illegal fishing, but would make it more difficult to get information on the catch levels, Miller said. CCAMLR allows some controlled fisheries and test fisheries, as a way to gather information. CCAMLR oversees legal fisheries for ice fish and two types of toothfish around South Georgia Island and krill in West Antarctica. There are about 10 vessels fishing for krill and 10 to 15 for toothfish, Miller said.

A test fishery has been targeting mawsoni in the Ross Sea for several years, with longline boats from New Zealand, South Africa, Uruguay and the U.S. In 2003, the fishermen took 1,792 tons of mawsoni, out of 3,760 tons allowed. This year the catch limit is 3,250 tons with 13 nations and 32 vessels permitted to fish.

"At least we're learning something about them," said Devries. "I think there will always be pirate fishing and if you don't allow some fishing then you'll lose (the fish) without ever learning what went wrong."

With such a large, wild ocean, catching illegal fishermen at sea has proven ineffective, so instead CCAMLR is trying to nab them on shore, when the fish are sold.

"We came to the realization that a simpler way to check is to look at the product," said Ray Arnaudo, U.S. commissioner to CCAMLR. "We like to think we're doing a pretty good job of making sure that the fish that comes in here has been legally caught."

Since 2000, all fish legally caught within Antarctic waters, including research harvest, are supposed to be reported to CCAMLR and documented. Like a passport, the documents are required to transport and sell the fish in 24 participating countries.

"If they try to come into the country and they don't have the proper paperwork, they can't import it," said Polly Penhale, biology and medicine program manager for the NSF Office of Polar Programs.

Last year, the National Marine Fisheries Service completed its first prosecution under the catch documentation scheme (CDS). The company Icebrands had been smuggling toothfish and lobster out of South Africa and importing it into the U.S. with falsified documents. About six other cases currently are being investigated, and in the last nine months, Dawson has denied entry to about four shipments of toothfish, she said.

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Photo by Kristan Hutchison / The Antarctic Sun

An albatross flies overhead near Palmer Station. Thousands of the birds are killed each year when they swallow bait on longlines and get pulled under water. Fishermen are required to use methods to prevent the birds from getting hooked, including lines that sink too swiftly for the birds to swallow the bait, but pirate fishermen ignore the regulations.

Photo courtesy Australian Customs

Fishing vessel Viarsa *being chased the ice pack in the Southern Ocean in August 2003.*

Fishing

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"The catch documentation system has been a huge part of cracking down on IUU (illegal, unregulated and unreported) fishing," Dawson said. "But the CDS is not going to be the save-all for IUU fishing in and of itself. We have several other monitoring, control and surveillance methods in the works that serve to bolster the effectiveness of the CDS."

Some illegal fishermen are still succeeding in getting around the regulation by lying or forging documents, which is why the U.S. is pushing for a centralized, computerized documentation system, Arnaudo said. A trial system started last year and is being expanded this year.

"These documents go through many, many iterations and are copied many times, so they're easy to forge," Dawson said. "When you cut out the paper, you cut out a lot of fraud."

Fishing boats are also supposed to carry satellite monitoring systems that track and report the vessel's location. At a CCAMLR meeting in November, eight countries agreed to try a centralized tracking system that would report all the locations directly to CCAMLR headquarters, making it more reliable. They are also considering a system of scientific observers aboard crab, squid and toothfish boats who wouldn't enforce the rules, but could report what they see to CCAMLR and fisheries officials. There is already an agreement allowing designated inspectors from member nations to inspect any other ship from another member country at sea at any time.

"Everybody should know where everyone else is and what they're doing," Miller said.

A few American scientists have been given inspector status and have boarded fishing vessels they came across while on a research cruise, said Arnaudo. Arnaudo said the U.S. is also looking into designating a CCAMLR inspector aboard the Coast Guard icebreakers Polar Sea and Polar Star, which have occasionally passed by fishing boats on their way to break the ice channel to McMurdo Station.

Photo courtesy Australian Customs

The patrol vessel Southern Supporter *escorts the fishing vessel* Viarsa *back to Australia after a 21 day chase across the Southern Ocean.*

"It's a long way from the U.S. and there are no easy ports, so we do not have dedicated enforcement vessels from the US," Arnaudo said.

The strongest at-sea enforcement comes from Australia and France, Miller said. Those countries have territorial waters within CCAMLR, where they are allowed to patrol and arrest illegal fishermen from any nation. France has arrested about 15 pirate fishing vessels. In November, Australia increased the amount it could fine illegal fishing vessels to $825,000, plus all costs of the chase. Australia also is establishing full-time armed patrols of its Southern Ocean territories around Heard and Macquarie islands. The ship will carry a deck-mounted .50 caliber machine gun, a Customs boarding party armed with handguns, Australian Fisheries Officers and merchant mariners able to crew apprehended illegal vessels.

Australia's heightened enforcement was spurred on by an incident that began Aug. 7, 2003, when an Australian customs vessel spotted a boat, with its name painted over, allegedly fishing illegally near Heard Island. It chased the *Viarsa* for 21 days and 3,900 nautical miles, through Antarctic pack ice, the stormy Drake Passage and around icebergs. The patrol vessel finally apprehended the *Viarsa* 3,335 km west-southwest of Cape Town, with the help of a South African salvage tug, South African icebreaker and a UK fishing vessel.

"As an organization, CCAMLR is not alone in facing this issue. It's a global issue," Miller said.

Photo by Kristan Hutchison / The Antarctic Sun

Cormorants rest near Palmer Station. Krill is a main food source for the birds.

Krill

Toothfish are more intensely fished, but krill fisheries have the potential to do even more damage to the Antarctic ecosystem because of krill's crucial place in the food chain.

CCAMLR actually formed in the 1980s when increasing harvests of krill in the Southern Ocean made scientists concerned about the effect on the rest of the ecosystem. The shrimp-like crustaceans are the breadbasket of Antarctica.

"There are so many species that rely on krill beyond penguin," said Palmer seabird researcher Cynthia Anderson, including skua and cormorants.

Birds, fish, ctenophores, whales all follow the krill, said Dan Martin, a science diver with the krill component of the Long Term Ecological Research program.

"You look for flocks of birds divebombing the water, like any good fisherman does," Martin said.

Researchers realized that a sustainable level of fishing needed to leave enough krill in the water to sustain penguins and other animals higher up the food chain, so CCAMLR became the first organization to attempt to manage a fishery based on the entire ecosystem, Miller said.

Demand for krill has dropped off since its peak in the 1980s, when 528,000 tons were harvested. During the 2002/03 season, it's thought about 126,000 tons of krill were caught by fishing boats from Japan, Korea, Poland, Ukraine and the U.S.

Now the main concern CCAMLR scientists have is that fishing vessels could directly compete with Antarctic animals for specific krill stocks in very localized

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Photo by Kristan Hutchison / The Antarctic Sun

Susan Trivelpiece packs equipment for Copacabana field camp, where she and her husband Wayne study penguins. Their research is used by the Commission for the Conservation of Antarctic Marine Living Resources to help manage the krill fisheries in the Southern Ocean.

areas, Penhale said. For that reason they are considering ways to manage krill fishing in smaller units.

The krill fishery also has potential to grow again, Stoddard said. The world fish farming industry is looking for sources of protein and is increasingly turning to krill. Krill is also used in some pharmaceutical products. Last year there were 372 international patent applications for commercial uses of krill, said Greg Johannes at Antarctic Tasmania. Some krill end up on dinner plates, with a salty, ocean flavor, Martin said.

"One of the things holding them back from fishing for humans (consumption) is processing them fast enough," Martin said. "They get these huge catches and I think they break down quickly."

Antarctic krill are unique for their size and quantity. They grow to the size of a little finger and form schools a mile or more across, as thick as a swarm of bees or crickets.

But the lack of fishing doesn't mean the krill are burgeoning again. The krill populations vary and may be reacting to a number of factors, including changes in the climate and sea ice.

CCAMLR looks at the research done by AMLR and the Palmer Long Term Ecological Research project to help understand the krill and make decisions about fishing levels.

"The political decisions take a great stock in the science," Miller said.

One of the researchers providing data used by CCAMLR is Wayne Trivelpiece, who has studied Adelie and gentoo penguins at Copacabana field station on King George Island for 35 years, with his wife Susan. They are supported by both the NSF and NOAA.

Photo by Cara Sucher / Special to The Antarctic Sun

Researcher examines a krill in the Palmer Lab.

They have watched the Adelie colonies they study shrink more than 50 percent, from about 20,000 penguins in the late 1970s to now about 8,000. They believe the decline is related to warming trends in the area, but also see changes in krill availability as a possible factor.

"Something was happening from the time they fledged to the time they returned," said Susan Trivelpiece. "There was a connection, obviously, between the krill and the penguin."

NSF funded research mentioned in this story:
Art DeVries, "Antifreeze proteins in antarctic fishes," University of Illinois Urbana
Wayne and Susan Trivelpiece, http://swfsc.nmfs.noaa.gov/antarctic.htm
Palmer LTER, http://iceflo.icess.ucsb.edu:8080/ice_hp.php
Other related Websites: www.ccamlr.org

Continental Drift

What Antarctic vehicle would you take home and why?

"I'd take home the Tucker because they're cool old machines. It'd be fun to have one of my own."

Jason Neely, *Pole Construction coordinator from Del Norte, Colo., ninth seasons*

"I'd take my Mattracks pickup. I drove five trips to Black Island with my Mattracks. I'd like to take it back to Arizona and put it to the desert test."

Jeff Kietzmann, *Palmer communication project leader from Surprise, Ariz., fifth season*

"Ivan the Terra Bus. I've always wanted a conversion van."

Renee Magyar, *McMurdo supply, from Vermont, first season*

Photos courtesy of John Stone / Special to The Antarctic Sun

A researcher on a rock deposit left by the Reedy Glacier, which is visible in the background.

Rock and ice tell the story of a different age

By Kris Kuenning
Sun staff

Is Antarctica still emerging from the last ice age? Researchers are studying the history of the Reedy Glacier to determine if the West Antarctic Ice Sheet is still receding.

Work done by Brenda Hall on the Ross Sea coast suggests that the ice sheet has retreated through that area fairly recently. While the rest of the world saw glaciers disappear 10,000 to 20,000 years ago, the ice sheet didn't pull back from Ross Island until 9,000 years ago. The retreat reached Beardmore Glacier 6,000 years ago.

"This suggests a late retreat of ice in the Ross Sea," said researcher John Stone from the University of Washington.

Stone, Hall and other researchers are using the Reedy Glacier to study the recent history of the ice sheet and to try to determine if it's still receding.

The Reedy Glacier, in the Transantarctic Mountains, is above the grounding line, or point where the glacier ice begins to float on the Ross Sea. The valley around the glacier holds a record of past ice levels. As the glacier flows, it deposits rock on the surrounding mountains.

This season, Stone collected 1,500 pounds of rock from sites on the western side of Reedy Glacier. He will use cosmic ray exposure dating to find out exactly when the rock was deposited.

Cosmic rays are particles emitted from tiny nuclear reactions in the atmosphere. They bombard the Earth constantly, and the radiation builds up in rocks.

While wrapped up in the glacier, the rock is protected from cosmic radiation by the ice, but once free, the rock begins to store radiation. By measuring the exact amount of specific isotopes in the rock, Stone can determine how long the rock has been exposed.

Stone was impressed with the number and quality of deposits he found. He started out looking at the bigger mountains, but discovered some smaller peaks closer to the ice shelf.

"In this case, the small peaks hold a wealth of information that we'll want to tap into next season," Stone said.

While Stone was collecting rocks, Brenda Hall was searching the valley for algae from melt ponds on the glacial moraine. Even at the southern points of the glacier, Hall found deposits that contained algae. She will use carbon dating to determine if they are left over from the ice age or if they have formed more recently. The researchers believe this may be the farthest south algae has been found.

The algae and rock dating will provide points for the glacial timeline. To understand how the glacier's position fits into the larger picture of ice movement, Howard "Twit" Conway from the University of Washington will construct a model of the glacier's movement.

Using radar, Conway and his brother Maurice traversed areas of the glacier to plot its thickness and find out if the glacier is frozen or melted at the bed. This information along with the current rate of movement will be used to construct an ice flow model of the glacier.

"The model will tell us how the thickness upstream relates to the transition from ice sheet to ice shelf downstream," Stone said.

Already, the researchers can tell that the glacier is at least 2 km thick, running in a trough that extends well below sea level.

From the model, a long history of the Reedy Glacier will appear, providing details not just from the last ice age, but also stretching back hundreds of thousands, and possibly millions, of years, Stone said.

"It will be a bonus to look at the very ancient behavior of the glacier as well," he said.

NSF research mentioned in this story: John Stone, University of Washington.
Brenda L. Hall, The University of Maine
Dr. Howard B. Conway, University of Washington, http://www.ess.washington.edu/Surface/Glaciology/

Profile

Groups have Clampet to thank for space

By Brien Barnett
Sun staff

Groups needing a space to get together for work or play have found Barb Clampet. The woman who runs the laundry was recognized recently for her service to the community in providing space for groups to meet. Area director Jim Scott presented Clampet with a certificate of appreciation at an all-hands meeting and a minute of loud applause followed.

Brien Barnett / The Antarctic Sun

Barb Clampett moves clothes from a washer to a dryer in the McMurdo laundry.

To newcomers, the laundry room may sound like a strange place to meet and conjures up images from movies of steamy rooms and sketchy characters. But in reality, the McMurdo bulk laundry is a clean, well-lighted spot that is convenient and centrally located in Building 155, home to the dining hall, housing, Rec and gear issue, and is aconvenient size for those who need something larger and more private than a lounge but smaller and more intimate than the gym.

Those who imbibe in the intense workout session called Gutz 'n' Butz were the first to use the laundry room. Three years ago, the group led by instructor Karen Joyce was looking for a home. Joyce approached Clampet and asked for permission to use the space. Clampet agreed and ran the request through the gamut of authority until word came back that it was OK to use the space as long as nothing was broken. Nothing has been, Clampet said. She still offers the space on a verbal agreement with the leader of anactivity. She said the groups respect and clean up the facility,

"It doesn't surprise me. They are responsible people and take good care of the place," Clampet said.

Other uses for the space have included belly dancing, an improv comedy troupe, a meeting spot for utility crews, morning stretches, wrestling, karate and break dancing. Clampet said she loves the diversity of the people. Since the use has grown, though, she doesn't take part in everything anymore.

Clampet grew up on the Rhode Island coast in an area called Potowomut. Her home now is South Carolina. The New England-Southern influences are reflected in a gentle accent when she speaks. It was back in South Carolina where she said she learned to work with diverse groups of people. There she worked as a crew leader of a group of kids and adults, ranging in age from 13 to 18, selling subscriptions to the Charleston Post Courier.

"I'd have seven or eight in my car at a time," she said. "It was just the different personalities and the radio stations."

Since her first season five years ago, when she joined her husband, John, to come to the Ice, Clampet has worked as a janitor, her official title. She cleaned rooms and did general duties for the first year before she was selected to work in the laundry, which at the time catered to the Navy. That meant pressing everything. including shirts, sheets and nearly everything else. It took five people to run the shop, including two just for the extra large sheet press, Clampet said.

Once the Navy left town, the need for the presses declined and eventually the laundry downsized. Clampet became the only one to run it. She gets help from other janitors who pitch in to get the sleeping bags, tents, sheets, comforters and even the red, cold-weather parkas cleaned. Clampet estimates the laundry processes about 2,000 articles a month.

Her job, though demanding, is only part of her life on station. Before she came to Antarctica, Clampet ran two dance studios with 200 students, teaching ballet, tap, jazz and ballroom dance. On the Ice, she still teaches tap dancing and hopes to get ballet sessions going next season.

Clampet also makes dolls. Not just plain dolls, but dolls resembling the people who work on the Ice, complete with the red parkas featuring zipper pulls, and the person's unique facial features such as blue eyes, bushy eyebrows or blond hair. Clampet gets requests during the season and works on them back home when she has more time. She's made about 35 since starting about two years ago.

There's a lot of care that goes into the dolls. One of her more interesting orders was from a woman who requested that the doll look like a friend, complete with a long scraggly beard and a baseball cap, because that's what he always wore around town. Clampet drove to North Carolina to a crafts store to find just the right one that fit the doll and her budget.

Back home, the Clampets enjoy riding bicycles. They spent one of their offseasons riding around Europe. But it's the people and the experience that draws her back to Antarctica.

"The people, they're like family," Clampet said. "They're very close to you and you know more about them than your own family."

Clampet said people on the Ice are her role models. One is the locally famous Mark "Commander" Melcon, describing him as a person she's respected for his kind and insightful demeanor. She said she wants to be more like administrative assistant Nancy Farrell, whom she calls a "great lady" who helps a lot of people behind the scenes. Though she said she wouldn't attempt it herself, Clampet said she admires the courage of Anne Dal Vera who skied to the South Pole on the American Women's Antarctic Expedition of 1992-1993.

Dal Vera returned the compliment.

"I'm always inspired by her smile and creativity. She comes up with wonderful performances for the women's soiree every year. It's really a treat."

Clampet said she plans to be back for seasons to come, but after a nice break this offseason.

"I want to see the flowers and trees and smells. That will be nice."

Profile

Rock 'n' roll captain shows deft hand at helm

By Kristan Hutchison
Sun staff

You might say Captain Robert Verret has saltwater in his blood, mixed with a little Cajun spice.

He grew up in Cut Off, Louisiana, about half an hour from the Gulf of Mexico. Most people there make their living off the water, on floating oilrigs or fishing boats. His grandfather owned tugboats and his father was the captain of a casino boat.

"Most of my family's in boats some kind of way," Verret said, his accent as full of Louisiana flavor as the Tony's Chachere's Cajun Seasoning he requires on galley tables.

More of a jock than a student, Verret played on his high school baseball team. His parents were prepared to send him to a local college, but he decided to work for a year first so he'd have some spending money.

"I wanted to go to a place I could party and have fun," Verret said.

Verret's first job was working on tugs for his uncle. When payday came, he forgot about college for good.

"I went from having $50 a week to $500 a week," Verret said.

That was about 20 years ago. Verret joined Edison Chouest Offshore, Galliano, La. and worked his way up to captain with an unlimited tonnage license. He was part of the original crew of the *Laurence M. Gould*, first as a relief captain and for the last two years as captain. He's also worked on the *Nathaniel B. Palmer* occasionally, including filling in as captain for a few months this season.

Verret works well with his crew and the scientists, showing a real interest in the research done during the cruises, said marine projects coordinator Andy Nunn.

"Rob is very friendly and approachable," Nunn said. "He's always laughing and smiling and seems to take a personal interest in everything that's happening on board, not just shipboard operations."

Wearing a t-shirt, jeans and a Patriots baseball cap, with tangles of brown curls hanging below his shoulders, Verret looks like a modern pirate captain. He plays heavy metal music on the bridge as he plows through icy waters.

"He's a loud and somewhat boisterous guy," said Al Sutherland, the National Science Foundation ocean projects manager. "You have to stop and take that all in and also understand how much he's involved in what goes on and how much he cares. That boisterousness actually becomes kind of an endearing part of his personality."

After so many years cruising the Antarctic peninsula, Verret knows it like the back of his hand, Nunn said. He can usually find a faster route or more efficient grid to get the science done, and it's almost always more scenic.

"Captain Robert really knows his stuff," Nunn said. "From tricky mooring recovery and docking operations, to keeping the ship safe in multi-year ice, he always makes it look easy."

Sutherland said Verret proved his skills as a captain during a series of four winter cruises, guiding the ship through heavy ice in Marguerite Bay, south of the Antarctic Circle.

"It was really hard for the *Gould* to operate in those seas and yet Robert was able to get the absolute most out of a ship that was really pushing its ability to maneuver and work," Sutherland said. "He had no trouble other times over in the Larsen Ice Shelf when things were tough to maneuver."

Verret's seen some rough crossings, with 40-foot seas and waves hitting the sides of the ship so hard an instrument unit was ripped out of the wall.

"You have waves you're almost looking at eye level here," Verret said from his position on the bridge, four stories above the water line. "All you can do then is just cut (the engines) back."

The sea ice is worst in August and September, once extending as far north as 61 degrees south latitude. In ice, the ship slows to 6 knots and the four-day journey once took eight days instead.

"(The ice) is always changing," Verret said. "You could work here 20 years and not know everything."

Photo by Kristan Hutchison / The Antarctic Sun

Captain Rob Verret on the Laurence M. Gould *as it unloads at Palmer Station Sept. 2003.*