The Antarctic Sun

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

January 26, 2003

On an exceptional continent, they're the exception to the rules

life...soil...warmth...streams...and a lack of ice in the Dry Valleys

One hundred years after their discovery...

Ten years after they became the focus of a Long-Term Ecological Research project...

One year after the flood...

This week *The Antarctic Sun* explores the McMurdo Dry Valleys, a contradictory place where the sun causes floods, pools of open water never freeze and footprints can last 50 years.

On a continent of ice, this is the rebel patch of dirt, a landscape as often compared to Mars as anywhere on Earth. And yet in these misfit valleys scientists are gaining an understanding of the ecological processes driving more familiar and complex ecosystems. For a virtual boondoggle, helo ride not included, turn to page 7.

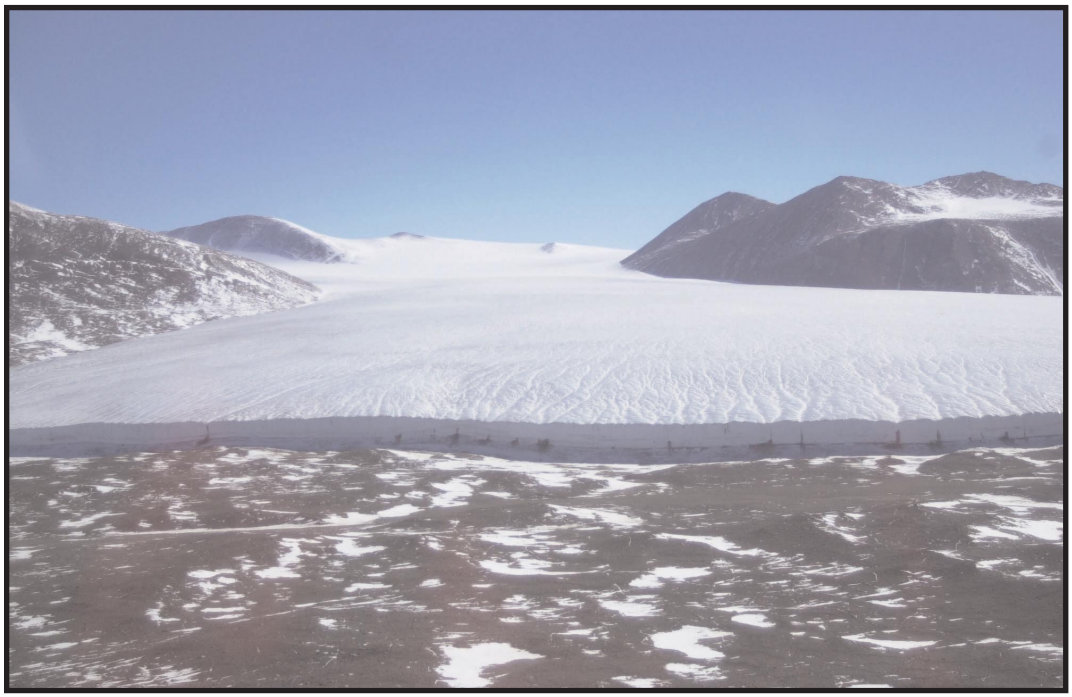


Photo by Kristan Hutchison/The Antarctic Sun

The Canada Glacier terminates in dirt, like all other glaciers in the McMurdo Dry Valleys.

Congressional delegation visits, praises program

More money for research, construction may occur

By Mark Sabbatini
Sun staff

The efficiency and enthusiasm of the U.S. Antarctic Program earned praise earlier this month from a visiting congressional delegation, with some members saying the program may get a big increase in funding during the next five years.

Seven members of the House Science Committee observed science projects at U.S. stations and field camps, viewed construction at the new South Pole station, and discussed life on the Ice with a variety of researchers and support staff.

The purpose of the three-day oversight trip was a first-hand evaluation of a program with $1 billion worth of facilities and an annual budget of more than $250 million, said Rep. Sherwood Boehlert (R-N.Y.), chairman of the House Science

See Visit on page 22

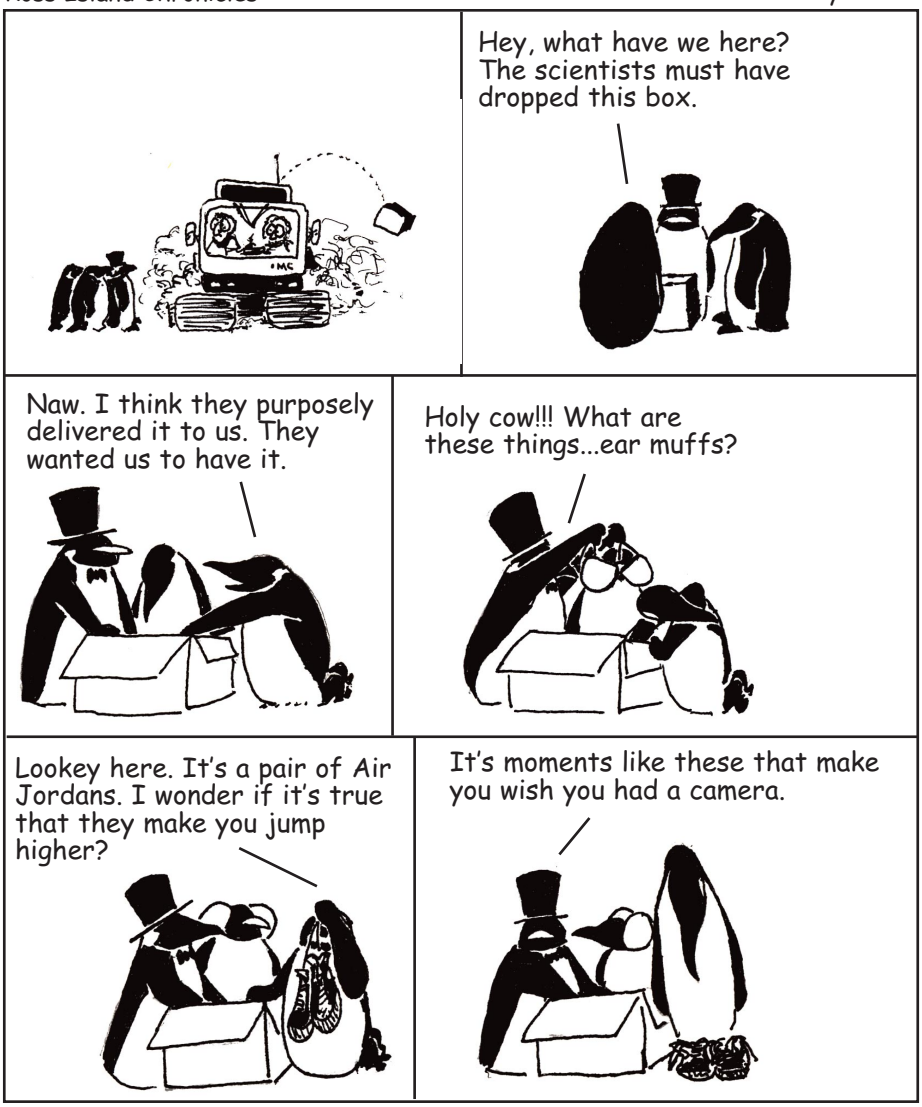
INSIDE

Quote of the Week

"Once a fungus crosses that line to kill and mass murder can it ever come back?"

- Scientist researching plant pathogens

Ross Island Chronicles By Chico



Cold, hard facts

Antarctic penguins

The longest studied Antarctic organism: **Adelie penguin.**

Most abundant and widespread Antarctic penguin: **Adelie (80 percent of the bird biomass in the Southern Ocean).**

Average weight of an Adelie: **9 lbs. (4 kg.) in Jan. and 13-18 lbs. (6 to 8 kg.) in Oct. and Nov.**

Largest of the 17 penguin species: **Emperor (average length of 45 inches (115 cm), or "waist high," and an average weight of about 44 lbs. (20 kg.))**

Average height of Adelie: **"About knee high."**

Average Adelie walking speed: **0.6-1.2 mph (1-2 kph)**

Average Adelie swimming speed: **4-4.5 mph (7 to 8) kph.**

Source: American Scientist*, David Ainley (penguin researcher) and nationalgeographic.com*

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

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Senior Editor: Kristan Hutchison
Editors: Melanie Conner
Mark Sabbatini
Copy Editors: Liz Connell, Wendy Kober
Publisher: Valerie Carroll, Communications manager, RPSC

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

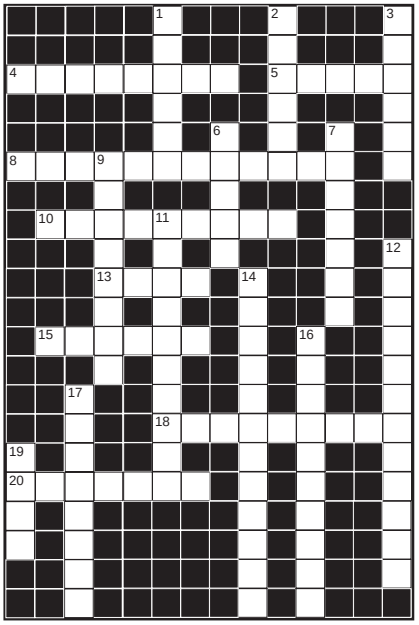
Web address: www.polar.org/antsun

Katabatic Krosswords: When it's time to leave

Across
4. The state most workers call home
5. For as little as $500 you can circle this after a season
8. Where departing Palmer residents start their travels
10. The country where ice researchers are likely to work during the "off-season."
13. The currency most departees need first
15. Wine bar a mere eight hours away from McMurdo, according to ad in coffee shop
18. This country is a mere $70 away, mate
20. Where South Pole winter residents get to spend their pre-winter "vacation."

Down
1. Government shorthand for standby flight status
2. U.S. stopover for $70 for returning workers
3. Do the Australia option and you'll probably start here
6. A high-altitude favorite of the highly active
7. A Christchurch bar famous for its Antarctic connections
9. What hiking is called in Nepal
11. First country for most departees
12. Where most can do some nearby island hopping
14. The city where travel begins for most departees
16. The first U.S. city most returning workers land in
17. What hiking is called in New Zealand
19. The low-budget lodging of choice in Christchurch

Solution on page 6



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

Treasure from the heavens

By Mark Sabbatini
Sun staff

Nearly 1,000 space rocks are on their way from one of the harshest environments on Earth to a place where they will be treated with infinite care and respect.

The Antarctic Search for Meteorites (ANSMET) program wrapped up its 26th season earlier this month, collecting 924 fragments from asteroids and other space bodies. The 12 researchers explored a familiar region in-depth, scouted another area for future trips and gathered information about work habits that may be used for planning space travel.

More than 14,000 meteorites have been collected by ANSMET teams since 1976, said John Schutt, lead mountaineer and science leader for the four-member team that conducted this year's scouting mission. He said scientists keep going back because "these specimens are some of the most accessible and also some of the best-preserved specimens" on Earth.

"It's the front end to a very large group of individuals studying meteorites all over the world," he said during a presentation at McMurdo Station highlighting this season's accomplishments. "This collection is actually not a U.S. collection; it's a U.S.-sponsored collection effort. It's a collection for the world."

The reconnaissance team flew about 250 miles from the South Pole to explore the west end of the Transantarctic Mountains "where West Antarctica is sort of pasted onto East Antarctica," Schutt said. He said they collected 317 meteorites during the season, scouting out several icefields in a region with a considerable amount of hard "blue ice," considered an ideal surface to look for specimens since little else can be found.

"Basically then every rock you find is a meteorite," said Nancy Chabot, lead field scientist for the second meteorite-gathering team.

The objective of the reconnaissance team was to cover areas relatively quickly and determine if any were promising enough to return for more. Schutt said there appear to be places worth returning to, as well as some areas of blue ice that still need to be explored.

A similar scouting trip during the 1980s led to this season's in-depth search of MacAlpine Hills, located near Beardmore Glacier. The team of eight collectors also spent four days at the nearby Goodwin Nunataks icefield "tying up loose ends from past seasons," Chabot said.

The larger team collected 607 meteorites from the two areas. The day they thought might be their last turned out to be the most productive. They set out hoping to find 40 meteorites so they would have a season-end total of 500. By the end of a 10-hour workday they had collected 113 meteorites and wound up collecting for another half day to search the rest of the area before departing.

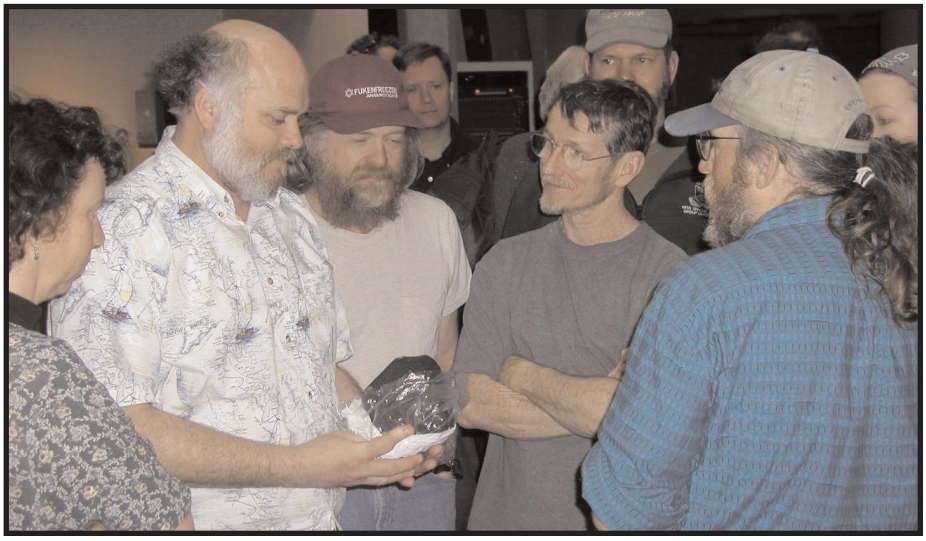


Photo by Mark Sabbatini/The Antarctic Sun

Steve Presher, left, a chef at McMurdo Station, inspects a meteorite recovered by the Antarctic Search for Meteorites team this season.

Also of note were about 60 meteorites found with a metal detector brought by Dante Lauretta, the first on an ANSMET hunt since the mid-1980s. Previous detectors were often ineffective because rock types in the Antarctic moraines produced a response similar to that of a meteorite, but newer technology features a "ground balance" that cancels out the dominant background rock, he noted in the group's online journal.

Nearly all meteorites – often distinguishable from rocks by a black "crust" caused by heat when they enter the atmosphere – come from the asteroid belt between Mars and Jupiter, and are classified as chondrites. Up to 10 percent have signs indicating they may be lunar rocks or from another planet, but those that can be definitely labeled as such are only a tiny fraction of 1 percent.

ANSMET members said they found a number of interesting specimens – distinguished by color, markings or other features – but won't know their likely origins until lab analysis is done.

"There's a limited amount of investigating we can do with these samples outside of a laboratory," Chabot said.

A new element to this year's mission was the participation of U.S. space program officials as the National Aeronautics and Space Administration (NASA) provided enough funding to allow three years of reconnaissance searches. Among them was Dean Eppler, a scientist whose company works with the Johnson Space Center in Houston. He gathered information on work and living habits in the field that may assist with determining how efficient astronauts can be on missions such as stays on the International Space Station and flights to Mars.

Eppler said he needs to conduct a detailed analysis of his 60 to 70 pages of notes, detailed to the quarter-hour, to analyze worker efficiency, but his initial impressions are about what he expected.

"You get a normal workday, maybe a little less, doing science," he said.

The next step is sending the frozen meteorites by ship to the United States, said Linda Welzenbach, the Smithsonian Institution's National Museum of Natural History's meteorite collection manager. They are expected to arrive in March, after which they will be sent to the Johnson Space Center in Houston for analysis and preservation, with a small piece of each allocated to the Smithsonian for identification. Once catalogued they will be available to scientists. More than 10,000 previous samples have been sent to about 300 researchers in more than 20 countries to date.

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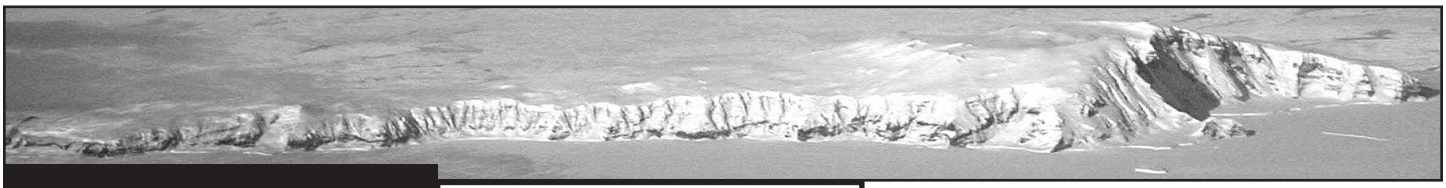
Journals from the ANSMET team and other information about the project can be found online at http://www.cwru.edu/affil/ansmet/



Perspectives

Getting 'pumped' for the flight

By Patricia Barnes-Svarney

Flying on the cargo plane to get to Antarctica fascinated me. Wall-to-wall (literally) people strapped onto flat seats reminiscent of an old military movie starring John Wayne, Tyron Powers and William Holden, with a few Ginger Rogers thrown in. But unlike the Hollywood set, our plane was crammed with people in bright red jackets and piles of Fruit Loop-colored luggage that look like a Boy Scout troop leader's worst nightmare.

But I digress.

My main concern here is to make sure you get the exercise you need during the flight. Certainly there must be something to keep the old heart beating faster or get that Richard Simmons stretch. To be sure, the New Zealand crew on our flight had the best exercise, climbing over the cargo and hanging on posts to check out systems. But being classified as cargo, we had more restrictions.

For those of you who crave the feeling of lactic acid building up in your system - whether you're a newbie heading for the Ice or a pro traveling back to New Zealand - here are some of the best exercises I found while on the cargo plane:

Early flight

Picture Snapping: When everyone finally boards the plane, the entire cargo bay erupts in a lightning display of camera flashes. So grab a camera. Swing first to the left, stretch and snap picture; then swing to the right, stretch and snap. Don't worry about moving your feet. Your bunny or FDX boots will already be wedged into the narrow aisles.

Luggage Lifts: For those of you who have luggage strapped in front of you, try lifting your bunny-booted feet onto the luggage (be careful not to catch a shoelace on the nearby strap winch). Hold for 10 seconds, then lower your feet. Repeat several times throughout the flight. For those of still in Picture Snapping mode, your feet on the luggage make a great picture.

Web Stuffing: The red webbing behind your seat is great for stuffing. You can use your upper body strength to stuff your red parka, fleece jacket, the nine pairs of gloves, or even the six pairs of socks you received from the Christchurch Distribution Center. (Careful not to lose anything behind the seat. That extra exercise called "Can't Quite Reach the Socks" is only for professional athletes.)

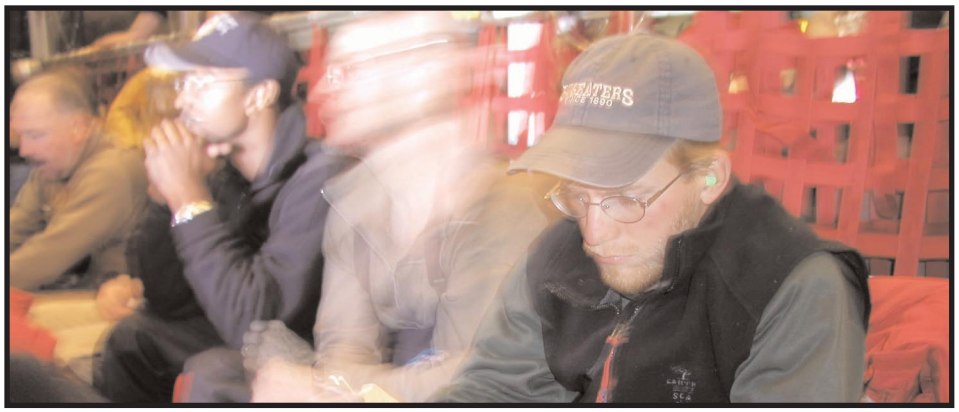


Photo by Kristan Hutchison/The Antarctic Sun

Antarctic program participants pass the time on a flight from Christchurch, New Zealand, to McMurdo Station.

Mid-flight

Novel Wrist Flips: This is only for those who enjoy reading. In mid-flight, the plane's interior becomes awash in a sea of books - from Tom Clancy and Leon Uris to Thomas Hardy and Charles Dickens. Flipping through the pages of your favorite tome favors the wrist and fingers.

Duffel Pulls: The duffel you crammed with your Gameboy and journal is stuffed under your seat. For those of you who desire working your pecs and triceps, just try pulling out your duffel several times. By mid-flight, the bag should be settled - and well-wedged - between the duffels to the left and right of yours.

Duffel Bends: No, you can't just stoop down and pull out your duffel - there is no room. You have to bend from the waist. So stretch those back muscles while you're down there doing the Duffel Pulls.

Sea of Legs Quad Lifts: Three hours have gone by – about halfway into the flight – so it's time to stretch your legs. And legs is what you will encounter, reminding you of the Rockettes at Rockefeller Center in field pants. Head toward the back of the plane by lifting your feet, with heavy bunny boots attached, over the said assemblage of knees. This builds up your quads. Do not cheat by stepping on other people's bunny boots to get through.

Fruit Juice Stare: I saw many doing this – staring at their fruit juice bottle for more than 10 minutes. It seemed to be an eye exercise. Or maybe they were asleep.

Late flight

Land-ho Neck Stretches: This one is easy. Simply wait until you hear someone shout, "Look out the window!" From there, almost everyone will stand up, seeking the nearest porthole to catch their first glimpse of the Continent (coming) or New Zealand (going). When it's your turn, hop on the seat below the porthole and stretch your neck toward the view. You can get in extra neck stretches if you look out portholes on both sides of the plane.

Basketball Garbage: Time to throw away the part of your lunch that wasn't munched down in flight? Try tossing your leftovers into the bag held by the load officer. And for those of you who drank the water and fruit juice, two extra points if you can bounce the bag off nearby cargo and into the Hefty garbage bag.

Bathroom Balance Beam: For those of you who couldn't hold it for the entire flight, here's your chance to practice your equilibrium skills. Balance is the primary key to this exercise. And aim.

And you thought you couldn't exercise in your bunny boots. Have a nice (and healthy) flight.

Patricia Barnes-Svarney is a participant in the National Science Foundation's Artists and Writers Program this season.

around the continent

PALMER

Earth to Palmer

By Tom Cohenour
Palmer correspondent

Bigger, better and faster. That's the best way to describe Palmer's new communication link. Known simply as the Earth Station, it looks like an enormous white golf ball on the hill behind Palmer.

Inside the 26.4-foot (8.05m) fiberglass geodesic dome resides a 16-foot (4.9m) diameter dish-shaped antenna. According to communications technician Jeff Kietzmann, the antenna doesn't need the dome to function but it provides protection from the elements such as high winds, snow and ice buildup. Kietzmann's eyes light up when he describes the antenna as "a dual reflector with Gregorian optics utilizing a two-Port, C-Band circular-polarized receive/transmit feed system."

Unlike some antennas that move to track a satellite, Palmer's antenna is fixed. No moving parts means less maintenance and less to go wrong.

The antenna faces north at a look angle of 16.6 degrees to see the Intelsat 706 satellite orbiting the Earth's equator at an altitude of 22,300 miles (34,804 km.). The orbit of the Intelsat 706 satellite is geosynchronous so the satellite orbits the Earth at the same speed the Earth turns, making the satellite appear to hover or be fixed in one location.

Beaming messages to a satellite up in space would be pointless unless the messages had a way of getting back to Earth. That's where an antenna in Sedalia, Colo., 20 miles south of Denver, comes into use. In Sedalia, messages from Palmer are received and transferred to a land line or the Internet for delivery worldwide. Messages sent to Palmer follow the same route in reverse.

Life and work at Palmer have changed radically with the commissioning of the Earth Station in October 2002. Whereas a good clear phone call would previously cost nearly $5 per minute on INMARSAT (International Marine Satellite), a call to Denver has no per-minute cost on the voice over IP (VOIP) telephones. Calls outside the Denver area can be made using a calling card.

Internet access is now 24 hours a day compared to the previous six-hour window that moved a few minutes each day.

For Raytheon Polar Services Co. employees, easy phone access has greatly improved interaction with colleagues at Denver headquarters. They enter a five-digit extension number and are immediately connected with the party in Denver. Regular phone conferences create a seamless flow of ideas and problem solving. Easy phone calls to family have improved morale.

Twice-monthly video teleconferencing has been instituted and video telemedicine can be supported so stateside physicians can assist with medical emergencies.

The data rate (bandwidth) is 384 kilobits per second. Prior to the Earth Station, it was a mere 56 kilobits per second – equivalent to home computer modem speed. The new speed also allows users to access Web pages quickly for scientific research and operational needs.

With its new Earth Station, Palmer feels a little less remote and a lot more connected. Bigger, better and faster.

SOUTH POLE

Cribbage in the cold

By Kevin Cullin

The South Pole Cribbage Club held the second annual cribbage tournament this past Sunday with the help of Louise Mercier in setup and as tournament judge. Eighteen entrants played in the singles bracket for station champion. The crown was won by Kurt Skoog with second place being taken by Scott McGlothlin. Six teams entered in the team competition with Kevin Culin and Rodney Mason coming out the victors and Richard Maxwell and Scott McGlothlin coming in second.

Photo courtesy of Kevin Cullin

The cribbage club gathers at the geographic South Pole.

The tournament capped a pretty successful season for the Cribbage Club which had a growth this year of six to eight new members. Members of the club celebrated the coming close of the 2002-2003 season with photos and games of cribbage being played at the ceremonial and geographic Poles.

The games ended quickly for obvious reasons but not before several team photos were taken.

SHIPS

Polar Sea

Hazards in the ice

By LTjg Lance W. Tinstman
Polar Sea *public affairs officer*

On Thursday, Jan. 16, *Polar Sea* was in the ice channel five miles from McMurdo. This area has been extremely difficult to navigate, consisting of 13 feet (4m) of solid ice, in addition to large boulders of ice broken up earlier. The ship was widening the channel when it began a pronounced shimmy and an alarm indicated a sharp drop in the level of hydraulic oil in the control system for the starboard, controllable pitch propeller (CPP). *Polar Sea* hove to and stopped the starboard turbine. A small amount of CPP fluid was discovered in the ice and water around the stern of the ship. A diver with a digital camera confirmed suspicions that we had lost one of

See Update on Page 6

the week in weather

McMurdo Station
High: 46F/7.6C Low: 19F/-7.4C
Wind: 50.6 mph/81.5 kph
Windchill: -11F/-24C

Palmer Station
High: 47F/8.4C Low: 30F/-1C
Wind: 26.5 mph/42.6 kph
Melted precipitation: 1.2mm
Snowfall: Trace

South Pole Station
High: -8F/-22C Low:-21F/-29C
Wind: 29 mph/47 kph

Update From page 5

the four 5-ton blades on the starboard propeller, one of three propellers on the ship. Luckily, there was no additional damage to the ship. The loss of one blade renders the entire propeller inoperative until the ship returns to dry dock.

The next day *Polar Sea* spent five hours recovering an estimated 400 gallons of spilled non-toxic CPP fluid from the surrounding water. The rest of it apparently had been diffused by propeller thrust at the time of the incident. The ship then went to the turning basin 15 miles from McMurdo to act as a secondary landing site for the search and rescue helicopters to aid in the PHI helicopter crash. As the weather cleared, the helicopters were able to return to McMurdo Station.

On Saturday, Jan. 18, the weather changed for the worse, which was great news for the ship's ice-breaking efforts. Forty-knot southerly winds greatly aided the channel clearing. The ship began running 24 hours a day, taking full advantage of Mother Nature's help. The ship went outbound to the ice edge, crossing into open water 34-miles from Hut Point. A 20-mile stretch of former fast ice had blown out to sea since the *Polar Sea* first entered the ice edge on Dec. 29. *Polar Sea* cut a "V" to help the southerly wind blow out the fast ice. By Tuesday morning, *Polar Sea* had reduced the channel's fast ice edge to 15 miles from Hut Point. At this point the channel was 1.5 miles wide, allowing ample room for additional ice to blow out. The plan was again changed as the ship closed in on McMurdo. The wind had reduced to about 25 knots and shifted more to the east, so a new "scalloping" procedure shaved 1/4- to 1/2-mile wide plates of ice working toward McMurdo. As the *Polar Sea* gets closer to McMurdo, the ice thickness will increase significantly, requiring the clearing strategy to change constantly, making adjustments in order to accomplish the most efficient progress. At the time of writing, open water had been brought to a point 11 miles from Hut Point. The ship hopes to make its next stop at McMurdo this weekend.

Nathanial B. Palmer
Pop stars and sonobuoys

By Chris Kenry
NPB correspondent

The sea does strange things to people. As evidence of this I offer the grantees who are now sailing on the *Palmer*, an odd bunch who all have given themselves names inspired by the group The Spice Girls. In some cases the names have been assigned on the basis of a physical or personality trait so we have Spaghetti Spice (because she wears tank tops with spaghetti straps) and Funky Spice (because, uh, he is so funky) but I'll admit I'm bewildered by the young, and quite feminine girl they call Old Spice. And then there is Sauna Boy. Sauna Boy was given his name early in the cruise after he set off the ship's fire alarm when he had the sauna set too high. And it is his name that brings me to the point (yes, there is one) of this article. The name Sauna Boy, despite its superhero connotations, is actually a clever little play on the word Sonobuoy, which is a device we've been using frequently on this cruise.

Sonobuoys are expendable listening devices. They are designed to be dropped from a plane or a helicopter but on the Palmer they are launched, quite spectacularly, from the back deck – just like those toy rockets you used to get from the drug store as a kid. They even have little parachutes that pop open to soften their descent. Once a sonobuoy hits the water it sinks for a few seconds but then buoys back up with an antennae poking out the top. Below the surface a hydrophone has dropped out and spirals down a preset length on a wire. This hydrophone listens to sounds in the ocean and transmits them back to the ship over an FM radio frequency for up to eight hours.

Sonobuoys are commonly used by whale watchers to detect whale soundings, or by the military to detect submarines, but on this cruise they are being used to acquire longer range seismic data than can be acquired with the seismic streamer. The streamer, a long hydrophone-filled tube that trails behind the ship, is used to detect reflected acoustic waves from the air guns but – since it is attached to the ship, and since the ship is always moving forward – the phones in the streamer can only listen for a limited amount of time and distance. The phones on the free-floating sonobuoys on the other hand can listen longer, and can continue to transmit data back to the ship for up to eight hours and thus, combined with the streamer data, they can gives a more complete picture of the ocean floor.

The Seismic Spicers will continue their work on the *Palmer* until Jan. 30.

Crossword solution from page 2

Continental Drift

What is your Antarctic dream job?

"This one. I love cooking. I love the people here. No place could be prettier. And I get just enough office time [at DHQ] to see folks I miss from the other side."
- Wendy Beeler, *Palmer Station food service supervisor, Bar Harbor, Maine*

"Probably to be able to go to the field camps, just to see more of the continent. The Dry Valleys would be pretty."
- Monique Carlson
South Pole materials logistics, 3rd year, Salt Lake City

"Something part-time in the office, part-time in the field."
Alena Berezin
FEMC administrator, McMurdo Station, Denver and Czech Republic

Antarctic Shangri-la

When Colin Bull found footprints in one of the McMurdo Dry Valleys, he knew they'd been left by members of Robert Scott's final expedition.

Bull knew because in 1958 his team was the first to visit the ice-free valley since it had been discovered and explored almost 50 years before.

"I found a pair of footsteps that we hadn't made that had been made in 1911," Bull said. "This was a sheltered spot and very, very sandy. They weren't well-formed footprints, but they were definitely footprints."

The footprints in the sand were a stark reminder of how unexplored the valleys were and how easy it is for humans to leave their mark.

Discovering an oasis

When Scott led a party of three down the as yet unnamed Taylor Glacier in 1902, he expected to follow it to the sea. They'd explored hundreds of miles of polar plateau, seeing nothing but snow and ice and a few dark mountain ranges pushing up out of the white.

"The direction of flow of the ice streams in the glacier basin had always been something of a mystery for us, and we thought that the main portion of the ice must discharge through this valley," Scott wrote in *The Voyage of the Discovery*.

To see where it actually led, Scott, William Lashly and Edgar Evans followed the moraine down into the valley until the ice was so rough they couldn't pull the sled any further. They pitched a tent by a boulder and, thus sheltered from the wind, camped for the night.

"We had a splendid view of the great ice masses sweeping down from above, but looking downward we were much puzzled, for the glacier surface descended steeply and beyond it stood a lofty groin of rock, which seemed a direct bar to its further passage," Scott wrote.

As they descended to the valley floor the next day, Scott discovered two ordinary things that were most extraordinary in Antarctica – dirt and running water. Except for the exposed volcanic shores of Ross Island and the mountain peaks and nunataks pushing through glaciers, Antarctica hides her surface beneath a thick coat of ice. And though that ice contains 90 percent of the world's fresh water, its frozen state leaves the continent a desert.

See Discovered on page 8

The view into the lower Taylor Valley from the narrow path between the lower Suess Glacier and a pile of moraine. In the distance are Lake Hoare and the Canada Glacier.

Stories and photos by Kristan Hutchison/Sun staff

Photo by Joe Mastroianni/Special to The Antarctic Sun

The blue ice covering Lake Fryxell comes from glacial meltwater from the Canada Glacier and other smaller glaciers. The freshwater stays on top of the lake and freezes, sealing in briny water below.

Discovered

From page 7

"It is an extraordinary novelty in our sledging experience to find that one can get water by simply dipping it up," Scott wrote as they hiked into the valley with pockets full of pemmican, chocolate, sugar and biscuit, and a cup.

The massive ice stream soon dwindled and the men found themselves standing on mud, leading Lashly to remark "What a splendid place for growing spuds!"

The day hike took them around several frozen lakes, later named Bonney and Chad. They looked up at hanging glaciers, down at "silver threads of running water" and crossed stretches of sand and "confused boulder heaps." Their picnic lunch was unlike any they'd had in their journey.

"(We) sat down on a small hillock of sand with a merry little stream gurgling over the pebbles at our feet," Scott wrote. "It was a very cheery meal, and certainly the most extraordinary we have had. We commanded an extensive view both up and down the valley, and yet, except about the rugged mountain summits, there was not a vestige of ice or snow to be seen; and as we ran the comparatively warm sand through our fingers and quenched our thirst at the stream, it seemed almost impossible that we could be within a hundred miles of the terrible conditions we had experienced on the summit."

Seven years later Shackleton sent Raymond Priestly, Albert Armitage and Philip Brocklehurst to examine the eastern end of the valley, though they didn't realize at the time that it was the same one. That wasn't discovered until 1911 when Griffith Taylor, a geomorphologist on Scott's *Terra Nova* Expedition, hiked down to where he could see over the Canada and Commonwealth Glaciers to McMurdo Sound.

The footprints had been left and no more was seen of the valleys until aerial photographs taken during Operation Highjump in 1946-47 revealed the Antarctic oasis Scott had found was really one of many, covering more than 1,160 square miles (3,000 sq. km).

Research begins

People now knew the valleys existed. They could measure the breadth and depth on photographs, but all this produced were questions. Why, on a continent covered with ice, did these hidden pockets of bare ground exist? What were the dynamics of such a unique place?

During the International Geophysical Year in 1957, while massive efforts went into setting up an airfield at McMurdo to supply a planned South Pole station, three biologists and a geology student were dropped off in one of the then nameless valleys. Their only maps were the ones of the coastline from Scott and Shackleton.

"It was a pretty spiritual sort of experience," said Peter Webb, the geology student who is now a professor at Ohio State University and for whom the Webb Glacier is named. "We were camping down on the lakes and each day I would climb a few thousand feet on these hills and it was an interesting feeling looking out on these views nobody had seen before."

After a couple weeks mapping the valley, Webb brought his photos and maps back to Victoria University in New Zealand, where Bull was.

"It looked like just the place for a little university expedition," Bull said. "It was ice-free and every other valley was filled with a glacier. These three weren't."

Bull put together a four-person expedition in 1958-1959, including Webb, that went back to the valley Bull named after Sir Charles Wright, a physicist with the British Antarctic Expedition of 1910-1913.

"It's very exciting to be the first person ever to go to an area and that's exactly what we did," said Bull, for whom Bull Pass is named. "Nobody had ever been to that valley; members of

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Scott's last expedition had been to Taylor Valley."

Bull found the Wright Valley suitably interesting, with "very peculiar weather by Antarctic standards." That summer the temperature rose above 50F (10C) several times and a few drops of rain fell, Bull said.

That first year they came up with more riddles than answers, such as how could a lake fed by glacial melt and frozen on top be 86F (30C) at the bottom?

"Lake Vanda was one of the most fascinating things I've ever come across," said Bull, who drilled a hole in the ice that first year and measured the lake's depth with a stone on the end of a string.

It took many more years to discover that the water at the bottom of the lake was warmer than the upper layers because the bottom water was so heavy with salt that even when it warmed up it didn't rise. A small amount of sunlight would make it through the ice and water to be absorbed at the bottom, and then stay there.

Another riddle was the warm wind. In most places where wind can either blow off an icefield or up from the sea, the wind from the ice is colder than the marine winds. Not so in the valleys, where the wind coming down from the southern ice was strangely warm. This counterintuitive phenomenon is caused by adiabatic compression, in which the air compresses as it descends into the valley and that compression warms it. The same kind of warm winds blow down the Alps into Austria and Germany, and from the coastal mountains of California.

Though dwarfed by the landscape, people can have a lasting affect.

At Lake Hoare, researchers sleep in tents near the Canada Glacier

Bull's team was also the first to find life in the area Scott had called "valley of the dead." There wasn't much, Bull said, but he found collembola growing on the edge of the lake, some lichen and mosses, and a few small insects.

"We found these little creepies and jumpies, you'll pardon the technical expressions," Bull said. "It wasn't completely lifeless, (but) there wasn't a hell of a lot going on."

After about 10 years they actually took some of the soil back to the main station and sowed grass seed in it, proving Lashly was right about potatoes.

"It grew perfectly well in the soils from the Wright Valley," Bull said. "All you need to do is put a cover over the whole of the Wright Valley to keep it warm and you could grow grass. I'm not suggesting it, mind you."

Bull continued to lead expeditions to the Wright Valley for several decades, including putting together the first women's expedition into the field in Antarctica.

It took him 10 years to convince the U.S. Navy to fly a woman researcher into the valleys. When they finally did, it was with the caveat that the expedition be all women and that they all have Antarctic experience. By stretching the definition of "Antarctic experience" to include women whose husbands had been to the Antarctic and women who had studied Antarctic rock samples in the lab, Bull put together a team of four qualified female scientists who went into the valleys in 1968.

"They had the same number of mistakes as a team of neophyte males would," Bull said. "They burnt the tent down, but nothing serious, and they did some good work."

Protecting it from ourselves

Years of research left more than footsteps in the valleys. The researchers were as tidy as they could be, Bull said, but garbage and human waste had to be left in the field.

"We burned what we could and buried the rest, which is as good as we could manage in those days," Bull said, "but these days they are being much more meticulous, which is a good thing."

Webb went back 25 years later and dug up the garbage pit from the original base camp at Lake Vanda to see what it looked like. The food scraps were dried, but unchanged. Since then many of the garbage pits have been cleaned up, said Geoffrey Gilbert, with the Raytheon Polar Services environmental department. The standards became more rigorous in the 1970s, when

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Members of the limnology team pile onto an ATV for the ride back to Lake Hoare camp.

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the international Dry Valley Drilling Project went into the valleys to take cores of the ground.

"They were extremely conservative and cautious environmentally," said Cassandra Shenk, also with the environmental department. "They had amazingly rigorous standards and procedures."

Even so, it wasn't enough. One of the assumptions the drillers made was there would be no way for liquid to flow below the surface, so they could safely fill the holes with diesel to keep them open. To their surprise, some of the diesel disappeared into the porous soil when it was poured into the holes. In other places groundwater rose up, causing the drilling fluid to overflow, said Gilbert, who is surveying the holes for future cleanup.

Environmental regulations were put in place in the 1990s. Now the environmental department reviews every grant for potential impacts. All camp waste is removed. Even used water and human waste are sealed into barrels and flown out each season. At Lake Hoare, the largest camp in the valleys, a "rocket toilet" burns human excrement to ash.

The first environmental review of the Long-Term Ecological Research in the valleys is underway. The greatest remaining concern is fuel, which is brought into the valleys in 55-gallon drums to heat buildings and power all-terrain vehicles. About 50 drums are brought to the valleys each season and every time they are used a few drops can spill out, Shenk said.

Plastic pans and absorbent pads are supposed to be used any time a liquid, fuel or otherwise, is transferred.

"Those are starting places, but I still can't say with confidence that we are managing the Dry Valleys in a way that's going to protect the scientific value as well as the aesthetic and wildlife value," Shenk said.

Seemingly small things, such as tourists pocketing ventifact rocks or stepping on the fragile desert pavement, will have the cumulative effect of destroying parts of the valley system that took millions of years to develop, Shenk said.

> "You go to the Dry Valleys and every human footprint is an ecological footprint."
> —Diana Wall, soil ecologist

To further protect the valleys, it's being proposed as one of the first Antarctic Specially Managed Areas. Under this new designation there would be more coordination among differing groups using the valleys, including American and New Zealand researchers and any tourist groups.

Specific areas will be set aside for tourists near the Canada Glacier, said environmental policy specialist Antonia Fairbanks, who is drafting the plan in Washington, D.C. Boundaries would be put on how far out the field camps can grow.

"The feeling is just that the numbers have increased over the past 10 years," Fairbanks said. "The main thing is it will prevent growth in the future that may be considered unnecessary.…There will be greater thought given to the long-term planning for the area."

The more scientists understand the valleys, the more they want to protect them. Researchers now recognize that even footsteps leave a mark on the ecosystem for decades, breaking the protective surface of the soil to allow erosion and trampling organisms in the dirt. Walking in dry streambeds crushes fragile freeze-dried algae that take two to five years to regrow.

"You go to the Dry Valleys and every human footprint is an ecological footprint," said soil ecologist Diana Wall.

Powerful polygons

Mysterious circles in the Arctic soils, strange mounds near Olympia, Wash., and columns of basalt in eastern Washington - *The Weekly World News* would call it the work of aliens, but Antarctic scientists know better.

Those ground patterns may be relics of the same processes that create polygon patterns in the ground of the Beacon Valley, said Bernard Hallet at the University of Washington.

"They look very much like cooling cracks in basalt," Hallet said.

The cracks develop as the subsurface sand freezes and contracts in the winter. In the summer, water seeps into the cracks, some of which are likely more than 13 feet (4 m) deep.

"These contraction cracks that form the polygons will actually crack rocks," said Ron Sletten, who studies the polygons with Hallet. "When the ground contracts it just pulls them apart."

Typically about 33 feet (10 m) apart, the cracks diverge at the rate of about a millimeter a year, so over a period of 10,000 years the entire surface should be completely disturbed, Hallet said.

He and Sletten study the polygons on the surface to help determine the age of ice underneath the soil. Another scientist, Dave Marchant from Boston University, found a layer of ash 8 million years old above the subterranean ice, indicating the ice must be older.

"If it's correct that means the ice is the oldest that we know about," Sletten said.

But Hallet and Sletten themselves haven't been able to find any samples of the airfall ash in four years working in Beacon Valley. Based on the turnover of soil seen in the polygons and the rate at which wind and evaporation wear down the ice, they think the ice must be much younger. If it were as old as Marchant claims, the ice would have lost 1,300 feet (390 m) in those 8 million years, based on their estimates of ice sublimation rates, Hallet said.

"Right now we have these various bits that suggest it's quite an active surface, that the ice could be much younger than that," Hallet said.

Down in the valleys

The complexities of a simple ecosystem

When Scott found the Taylor Valley, he called it a "valley of the dead," but valley of contradictions would have been more accurate.

The area has more life in it than most of the Antarctic mainland, including the largest land creature – an insect half as big as a grain of rice.

"Outside the Peninsula, this is probably the hotbed of life," said Russell Rodriguez, a researcher studying bacteria and yeast in the valley soil.

Officially called the McMurdo Dry Valleys, they are actually wetter than the frozen plateau, with running streams, ground water pushing up from drill holes and liquid moats in the summer. Colin Bull, one of the original researchers in the valleys, insists they shouldn't be called dry at all, but more accurately the "ice-free valleys."

"It's these blasted Americans for the last 40 years that have been calling them the Dry Valleys," said Bull, originally from New Zealand. He even saw it rain in the Wright Valley in the 1950s.

Summer melt starts with a few trickles sliding down glacier sides and icicles (top) and gathers into streams (bottom).

"It was only two drops, but it constituted rain," Bull said, "and I've read many statements that it never rains in Wright Valley."

Snow clouds from the coast occasionally hit the warmer air flowing down the valley and melt as they fall, confirmed Peter Webb, who also spent many years researching in the valleys. Usually the rare rains evaporate while they are still in the sky, said Andrew Fountain, who now tracks the weather through the Taylor Valley.

"I've seen rain, but I've never felt it," Fountain said.

Snow also tends to evaporate before it can be measured on the valley floor, Fountain said. The lack of snow or ice cover is the ultimate contradiction in the valleys. On a continent almost completely covered with ice almost 3 miles (5 km) thick in places, the valleys are oases of exposed dirt. Only 2 percent of Antarctica is ice-free, most of it on the Peninsula or steep mountain peaks poking through the ice, but the valleys are pockets of low-lying, bare soil on the mainland.

They've been that way for the past 8 million years, at times filled with giant lakes, at times almost empty. The glaciers that ooze in the edges of the valleys have retracted and advanced, but never far, and probably have been in their current positions for the last 6,000 years, Fountain said.

The primary reason the valleys are ice-free is the Transantarctic Mountains form a dam there, holding back the East Antarctic Ice Sheet.

"If you block the glaciers, you're suddenly not going to get a lot of ice accumulation," Fountain said.

The few places the icesheet can push through into the valleys – the Taylor, Ferrar and Wright Upper glaciers – are so constrained that the flow of ice is slowed down to a point that it sublimates, which means to evaporate without first becoming liquid, and melts from the glacier front as quickly as it is replenished, Fountain said. The other glaciers in the valleys are local alpine and piedmont glaciers, with such small areas of snow accumulation they can't spread much farther into the valleys. Three of these mid-sized glaciers - the Suess, Taylor and Canada - are advancing, which Fountain attributes to an increase in temperature of 4F (2C) over the past 1,000 years, but overall the glaciers seem to be just holding their ground.

The lack of ice cover helps preserve the valleys, as the dirt and rocks absorb heat the snow would reflect back.

"On a good day (the valleys) can be 10F to 15F degrees warmer than McMurdo," Fountain said. "It is a banana belt."

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From the air, above, the dry, cracked ground contrasts with the frozen Lake Fryxell. The bluer band of smooth ice around the Lake comes from a seasonal moat around the lake. At left, freeze-dried algae poke out of the ice at the base of Suess Glacier. As water melts off the glacier it pools there and rehydrates the algae.

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As the glaciers slide down into the valleys they melt faster, becoming springs of life.

Glacier-fed valleys

Summer comes to the valleys with the sound of water dripping off the glaciers and gurgling as small streams tumble to the lakes.

Running water is an unusual sound for the Antarctic mainland, where usually only the wind speaks up in the frozen silence. But in December, when the temperatures in the valleys warm to freezing or just above and the sun mutely works on the glacier cliffs, suddenly water chimes in.

"The melt water flow from the glaciers is the only source of water to the ecosystem, so to understand the ecosystem you have to understand how the water gets off the glaciers," Fountain said.

Very little of the glaciers actually melt most years. The lower parts of the glaciers generally lose about 2 inches (5-6 cm) of water over their entire surface, Fountain said. About 50 to 70 percent is sucked away by the dry winds and 5 percent breaks off as the glaciers calve, leaving only 25 to 45 percent to actually melt.

The valley temperature drives the melting, but where the glacier melts is often determined by where the sun is hitting. The cliff-like walls of the glacier catch the full brunt of the sun as it circles over the peaks, melting rapidly in turn when the sun is on them and then slowing or stopping when the sun moves on and they fall in shadow. That daily cycle shows in the streams below. Karen Cozzetto has watched the water level change over the course of a couple hours this year, as she monitored stream flow.

"It's pretty amazing how sensitive they are," she said.

The level of flow varies by a factor of two or more during the day depending on the sun's angle, said Diane McKnight, who has studied the valley streams since 1990. She was able to develop a model taking that daily cycle into account, which has become a useful computational tool.

"Now we can apply it to more complicated systems," said McKnight, who has used it to understand streams in the Rocky Mountains that experience a 20 to 30 percent variation in flow from night to day because of evaporation.

Snowfall on the glaciers also affects the amount of melting by reflecting back more sunlight and insulating the ice from the melting rays. Most years the equivalent of 4 to 6 inches (10-15 cm) of water falls as snow on the upper reaches of the glaciers, with less falling lower. Snowstorms can come anytime, year-round, even in the middle of the summer as they have this year.

"It can basically just turn off the valve of melt," said Thomas Nylen, another glaciologist working in the valleys.

Freeze-dried life

When the melt valve turns on it rehydrates life in the valleys, quite literally. Freeze-dried algae in the streambeds and dried-up worms in the soil, called nematodes, soak up water like dry sponges and revive.

The algae come in four colors. Red and orange algae streak the bottom of streams, as if painted on in brush strokes. Black algae line the edges like pieces of burnt popcorn. The green algae live under rocks. In the winter the algae dry up. It crumbles to a powder when touched, but add water and within 20 minutes it is flexible and its metabolism is functioning. In one experiment McKnight's "stream team" diverted water into a riverbed that had been dry for about 20 years and within weeks the algae were growing again.

"Some of the (algae) mats are so big they look like really short seaweed in the stream as they float back and forth," said Jenny Baeseman, leader of "algae ops" this year.

About half the streams have algae, depending mostly on the streambed, McKnight said. The presence of algae influences the nutrient content of the water that reaches the lakes, since the algae uses up whatever there is, McKnight said.

The algae provide food for some nematodes, a theory confirmed last week when soil ecologist Diana Wall obtained a photo of a

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In a lab at Lake Hoare, Jill Mikucki fills sample jars with water taken from specific levels in the lake. The samples will be analyzed for changes in the biochemistry.

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Eudorylaimus antarcticus nematode with a spot of orange algae in its gut. Other nematodes live on yeast and bacteria, and maybe even other nematodes, Wall said.

Some patches of ground have up to 5,000 of the most common nematode, *Scottnema linsayae*, per kilogram of soil. Like the algae, the nematodes can dry up, losing 99 percent of their water to enter a state called anhydrobiosis for the winter.

"They can be totally desiccated and stay that way for 60 years, as far as we know," Wall said.

Though they don't move more than a millimeter in the soil when they are hydrated, in their dry state the nematodes can be blown about by the wind. In that manner they can spread far, as proved by a *Scottnema linsayae* a Kiwi scientist brought back for Wall from some soil around the Beardmore Glacier.

The nematodes aren't alone, either. Other microorganisms, called tardigrades and rotifers, live in the dry soil.

"There certainly is a lot of life out here," Wall said. "It's just a moving mass. It's unbelievable when you see it all tied up in algae."

Life in the dead lakes

The streams link the glaciers to lakes on the valley floor, bringing in nutrients to feed the bacteria and phytoplankton in the lake. Though the lakes are still drawing on carbon left from more productive times thousands of years ago, the streams are the only present source of new

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Valleys a natural lab

The McMurdo Dry Valleys are as important to scientists for what they lack as for what they contain.

Without fish, trees, grass, mammals and a whole list of other green and growing things to get in the way, scientists working in the valleys are able to follow some of the basic ecosystem functions.

"What we're trying to do is understand how the ecosystem works, trying to put all the pieces together," said Berry Lyons, leader of the Long-Term Ecological Research project in the valleys. "We have experiments we can run out there that nobody else in the world can run."

"We have experiments we can run out there that nobody else in the world can run."
—Berry Lyons, leader of Long-Term Ecological Research project

The National Science Foundation started the LTER program in the U.S. in 1980 as a way to gather broad-based ecological data over a long timescale and the Dry Valleys were added 10 years ago. The concept worked well for last year's heavy melt, since the LTER researchers in the valley already had nine "normal" years of data for comparison.

Gathering data over the long-term is the only way to make sense of it, said Christine Foreman, a post doctorate researcher from Montana State University working with limnology team under grantee John Priscu.

Though Foreman's father can't understand why she'd come to a lake without fish, she considers it the perfect place to study lake chemistry and carbon cycling.

"It's kind of a nice system for me to study because it's a microbial system. We don't have those higher order things to mess it up," Foreman said.

The simpler ecosystem makes it easier to trace the movement of specific chemicals through it. Jenny Baeseman is trying to trace the cycle of nitrogen in the streams. Back in the U.S., the inundation of nitrogen from fertilizers has become a problem on the Mississippi River and the Gulf of Mexico. By understanding it in the Dry Valleys first, Baeseman hopes to be able to go back to the U.S. and apply the knowledge there.

"With all good science you have to be able to apply it to a broader picture of the Earth as a whole ecosystem. That's one of the great things about the LTER program," said Baeseman. "They are set up in all these diverse environments and using all that data together you can get a much better picture."

In the 1980s Priscu was able to study the way phytoplankton adapt to a stable environment, where the water doesn't move, and then apply what he'd found to the more complicated ocean systems. The permanent ice cover on the lakes offered a relatively simple system to untangle the complexities that exist in the open ocean, Priscu said.

"What we're learning is how the components of the terrestrial ecosystem depend on each other in a very simplistic form compared to its forested counterparts," said glaciologist Andrew Fountain. "We're here because it's a fairly isolated system, a relatively simple system, and we can look at some of the basic flow paths of energy and nutrients."

The simplicity of the valley ecosystem has made it easier for all the scientists in the Long-Term Ecological Research project there to work together, said Diana Wall, who has worked on two of the other 23 LTER sites as well.

"We can see a small change in temperature or a small change in water and link it to the whole system," Wall said.

The 10-year-old Dry Valleys LTER site received strong praise from an oversight review last year.

"They said they'd never seen such an integrated group of disciplines coming together," Wall said. "This one is real exciting."

Some of the crossover occurs because all the scientists in the valleys do their work in the same short season, working out of a limited number of field camps where there is a constant information exchange.

"Just hanging around in the

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kitchen you learn so many things," said John Gartner, a first-year member of the stream team.

Extreme ecosystem

The Dry Valleys site is unique among the LTERs, marking the extreme end for life on Earth. With an equivalent of about 1 inch (3cm) annual precipitation in meltwater and annual average temperature about 1F (–17C), the valleys are at least 13F (7C) colder and much dryer than any of the other sites.

"This is the last place where you have lakes, streams and soils all integrated together in a terrestrial ecosystem and the system is on the verge of breaking down because of the climate," Fountain said. "For six months of the year, or maybe eight months of the year, the system doesn't function as an ecosystem. The system shuts down, the lakes cap over."

Because of the unique environment, Priscu and other researchers have found novel microorganisms and biogeochemical pathways.

"We're always turning up little odds and ends here," Priscu said. "It's an evolutionary hotspot in an icy environment."

The valleys are also a hair-trigger indicator of climate change, with glaciers suspended above, "perched right between liquid and solid," Priscu said. Watching for indications of climate change is one of the missions of the LTERs. In the valleys, the first sign may come from the glaciers, which are poised around 32F (0C) in the summer, so all it takes is a few degrees to flood the valleys.

"It's the canary of the planet; it's one of the most sensitive indicators of environmental change on our planet," Priscu said. "We see just a little warming and we see a whole cascade of environmental changes.…If we warmed it 9F (5C) higher plants would probably start sprouting up out there."

Photo by Joe Mastroianni/Special to The Antarctic Sun

A unique combination of bare ground and ice-covered lakes define the Dry Valleys, which the Long-Term Ecological Research project has studied for 10 years.

The valleys' model has been taken even farther, outside Earth's orbit to help scientists understand other planets.

"It's the closest analog we have for extraterrestrial environments and it is hard not to get involved in the extraterrestrial side of things when you study microbes in the cold deserts of Antarctica," Priscu said. "The bottom line is I keep studying because I keep coming up with questions."

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nutrients. Lake Fryxell, with the most streams coming into it, is also one of the most biologically active lakes.

"If you stop the nutrient inflow, we would expect the biological activity to go down," said John Priscu, who studies the frozen lakes.

Generally the nutrients are low in the lakes and plankton production is limited by the amount of available phosphorous and nitrogen, Priscu said.

Up to 70 percent of the stream water never makes it into the lakes, instead soaking from 8 inches to 20 inches (20 to 50 cm) into the soil or evaporating. Some of the water in the soil mixes back into the stream later, pulling dissolved salts from the soil along with it.

"For the longer streams the concentration of dissolved salt increases as you go downstream," McKnight said. "We think there's some relationship, for instance, Lake Hoare is not as salty as Lake Fryxell, which has these long streams that flow into it from the south side."

Lake Hoare is also a younger lake, created less than 1,000 years ago when the Canada Glacier dammed the flow of water down valley to Lake Fryxell. Since water has no way out of the lakes except evaporation, all the salts, nutrients and chemicals the water carries stay in the lake, increasing in concentration over the years and making the older lakes much saltier.

Streamflow is also responsible for sealing off the deep, briny lake water. In the upper Wright Valley some small pools of extremely salty water, like Don Juan Pond, stay liquid year-round all the way through, Priscu said. The same might have been true of some of the ice-capped lakes, before freshwater from the glacial streams emptied into them. Because the freshwater is lighter than the dense brine, it floated above and froze to cap the lakes.

Sealed off from the mixing effects of the wind, the lake water below the ice remains very still and stable. At the bottom of the lakes is older, denser water, typically much saltier than seawater and often much warmer than the upper layers. Lake Vanda, with some of the "cleanest surface water in the world," is the warmest, heating up to "room temperature" or 77F (25C) on the bottom, Priscu said. Lake Vanda is also the saltiest, with water about eight times as salty as the sea.

But Lake Bonney's two distinct lobes contain some of the most unusual chemicals. Halfway down in the east lobe of Lake Bonney is a layer of water saturated with nitric oxide, the same "laughing gas" dentists administer to patients. The bacterially produced gas is present in densities 700,000 percent greater than the air saturation.

Lake Bonney also has the highest natural densities of dimethylsulfoxide, which athletes used a decade ago to rub on sore muscles because it penetrates membranes and makes them pliable.

"We think the chemical is here because it offers protection against the cold and salt," Priscu said. "The organisms are producing compounds that are letting them live in these cold, salty environments. It's just another survival mechanism for Antarctica."

While most of the nutrient flow is into the lakes, a little cycles back out. As the lakes rise and fall through the decades they leave a 10-to 13-foot (3-4 m) band of nutrients around banks. Algae in the lake also occasionally break off the bottom, float up and work their way through the ice cover. On the surface, the algae is broken to pieces and distributed by the wind, reseeding the soil with nutrients.

"It's been fascinating to see just how alive that valley is when the sun comes out and the streams start flowing," Rodriguez said. "There are lots of mosses out there, and lichens and algae."

Though the valleys are full of life, they're slowly dying. Organisms in the streams, soils and lakes are all using nutrients deposited by a lake that filled the entire Taylor Valley 10,000 to 40,000 years ago. They're slowly depleting the stores of carbon essential to life.

"They're eating carbon faster than it's being produced right now," Priscu said. "Right now the Dry Valleys are dying, they're winding down."

Photo by Steve Alexander/Special to The Antarctic Sun

At New Harbor, last season's high water starts with a trickle. Biologist Steve Alexander looked at the foam under a microscope and found it was crawling with collembola, a primitive arthropod that looks like black beetles when magnified.

What the flood revealed

High water marks dry landscape

Without a single raindrop falling or a cloud in the sky, the McMurdo Dry Valleys flooded last season.

It was unseasonably warm for any Antarctic season. After an unusual December storm blew through, the temperature rose and stayed above freezing for about a month.

"Last year was really warm. We had many days of temperatures around 10C (50F) and we had water all over the place," said glaciologist Andrew Fountain, who tracks the climate through the Taylor and other ice-free valleys near McMurdo. "We hadn't seen anything like that in over a decade."

The heat wave helped researchers with the National Science Foundation's Long-Term Ecological Research project in Taylor Valley understand evidence they've found from warm, wet years in past decades, which seem to be part of the natural cycle.

This year the LTER project was able to send several extra people into the field to assess the impacts of the historically high water on a famously dry area.

"Just going out there you can see there was much more moisture in certain locations," said Berry Lyons, the lead investigator for the valley LTER. "You can see the remnants of that (moisture)."

Glacial meltdown

Some days last summer glaciologist Thomas Nylen was able to wear shorts on the glacier. Aside from attire, walking on the Canada, Commonwealth and Howard glaciers became trickier during the heat wave, and remains so. "Ice swamps" developed where the glaciologists would step on what looked like firm ice and break through up to their shins in meltwater, Fountain said. Streams engraved the glacier tops, some leaving channels a meter deep for Nylen to cross. The flowing water, where usually there is none, poured over the top in cascading waterfalls or drilled holes into the glacier and then came tumbling out the glacier side.

"Last year it was amazing, waterfalls coming off the Commonwealth glacier like you were in the tropics somewhere," Lyons said.

The glaciers lost about two to three times as much ice as normal, Nylen said. In some areas, up to a meter melted away, where in a typical year 16 to 20 inches (40-50 cm) would be lost.

"The glacier's surface changed considerably," Nylen said.

The once smooth glacier surface is now pocked and rough from last summer's melting, changing the way it reacts to the wind and sun. The wind that used to sweep cleanly over the top, evaporating away any meltwater, can't reach into all the indentations and gullies.

Empty stream channels remain on the glacier surface, collecting drifting snow. Nylen expects it will take three to four years

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Antarctica's longest river

There's the lush Amazon, the mighty Mississippi, the exotic Nile… and the Onyx.

At 12 miles long, the Onyx River would be an obscure stream most places, but it's the longest stretch of flowing water in Antarctica, putting it on the list of "longest rivers on each continent" alongside much larger and more famous torrents.

"We think that's the biggest river in Antarctica," said Diane McKnight, who's been studying streams throughout the valleys for over a decade.

The Onyx is the only river on that list that only flows seasonally, starting up each summer as glacier melt overflows the Lake Brownworth below the Wright Lower Glacier and spills over into Wright Valley. It gathers force, joined by six to 10 trickles and tributaries, said Chris Jaros, a graduate student studying the Onyx.

It is also the only "longest river" to empty into a landlocked lake, flowing away from the sea rather than toward it. The shallow and wide river doesn't always make it to Lake Vanda. When Jaros was there two years ago, half the time the Onyx dried up before reaching Lake Vanda.

In the 2000-2001 season, a particularly low-melt year, about 200,000 cubic meters of water ran down the shallow and wide river. In the following season the river reached a near flood-stage, with about 17.1 million cubic meters of water filling the river to waist level. In a previous high water year in 1984, New Zealand researchers rafted down the Onyx, said John Priscu.

"It's reported it was kayaked," Jaros said. "It makes a lot of sense; it's got enough flow and there's no boulders."

Photo by Ron Sletten/Special to The Antarctic Sun

The Onyx River lived up to its status as Antarctica's largest river during last year's flood.

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for the glacier surface to smooth out again. Until then, the deeper channels could generate more melt, as their steep sides catch the full brunt of the sun.

Last summer's melting also exposed more rock and dirt on top of the glacier. Some of it was swept down in the rush of meltwater, bringing new nutrients into the streams below, Fountain said. Other sediment is left exposed on the surface and could cause more melting this year as the dark spots absorb the sun's heat.

These pockets of sediment often melt into the glacier, developing temporary puddles or pockets of water called cryoconite holes. The LTER group has been studying algae and microscopic organisms called rotifers and tardigrades living in the holes.

"It's kind of like a little mini-ecosystem down there," said Christine Foreman, a post-doctorate researcher from Montana State University with the limnology team.

Microbial activity in the cryoconite holes may alter the geochemistry of glacial melt and consequently the chemical nature of the streams, including providing a previously undocumented source of carbon, said Priscu.

A stream gauge at the base of the Canada Glacier waits for water.

Flash flood

Biologist Steve Alexander was in New Harbor when the stream started to flow last season. In 18 years working there, he'd never seen the water begin its seasonal course down the riverbed next to their camp.

"I see this, like mini flashflood coming and the front of it had this brown foam on it, like someone had poured shampoo in," Alexander said.

The inch-deep water flowed at a slow walking pace, soaking into the ground as it went. The sudden gush at New Harbor was just a fraction of the water flowing upstream. Streams overwhelmed gauges meant to measure their flow. They changed courses, cutting new paths through the soft soil. Stream volumes in the valleys were two to three times higher than they'd been in previous high flow years, said Diane McKnight, who has been measuring the streams since before the LTER started.

For the streams, it's either flood or drought. There is no "average-flow" year. From 1990 until last summer McKnight measured three high-flow years on the 10 streams draining into Lake Fryxell, which contributed about 2 million cubic meters to the lake, and six low-flow years, which ranged from 200,000 to 400,000 cubic meters of flow. Even compared to such wide variations, last year was extraordinary, producing 5 million cubic meters of water for Lake Fryxell.

The difference between a low- and high-flow year depends on just a few degrees temperature difference. In high-flow years, the temperature average is above zero. In low-flow, it's below.

"We have a sense of how a relatively small change of temperature during the summer can cause a very large response," McKnight said.

More water isn't always good for life. In low-flow years algae mats grow in the streams. Last year the volume of water washed some of the algae away.

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At left, John Priscu's limnology team works in an orange fabric shelter on Lake Hoare to protect microbial life in the water samples they are taking from being shocked by the light. Jill Mikucki fills labeled bottles with water drawn up from a specific depth with a handcrank while Tucker Stevens looks on. Nutrients are added to some of the sample bottles, which are then suspended on a line back under the ice to see how the added nutrients affect their productivity. To lower the samples into the ice without exposing them to light, Brent Christner is covered with a tarp, above. The samples will be analyzed both in Antarctica and back at Montana State University in Bozeman.

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"There's definitely a lower diversity left (this year)," said Jenny Baeseman, leader of the team measuring algae in the streams. "We had such high flows last year it scoured off a lot of the algae."

Of the four algae colors – black, red, orange and green – the green seems to be completely missing this year. Seeing which algae survived and which were washed away tells the researchers something about how well the different algae attach to the stream beds.

Streams bring fresher water into the lakes, with nitrogen and phosphorous to spur plant growth within the lake. This year the lake water should be diluted, but it may also experience an influx of nutrients from the algae carried down into the lakes, Lyons said. Until the algae regrows, the stream water may also carry more nutrients to the lakes, since the algae usually filter out and use up most of the nutrients before they reach the lake, Baeseman said.

"They're actually cleaning the water, if you will," Baeseman said.

Population boom

A year after water drenched the valleys, the soil in some areas is teeming with microscopic worms, called nematodes.

"What's so remarkable about this is to see a change in a year," said Diana Wall, a soil ecologist. She said she hadn't seen anything like it before in her 13 seasons studying nematodes in the Dry Valleys.

It's easy to look at a desert like a package of freeze-dried food – just add water. In previous years Wall had tried that on sample plots in the valleys, pouring water on a section of soil and watching for changes in the nematodes populations. Those single pulses of water just evaporated away in 10 to 15 days, almost unnoticed by the nematodes.

The inundation of water last year was different, though.

"What this was, was a season's worth of water," Wall said. "It was a whole ecosystem response to warming."

As expected, moisture in the soils near the lakes and streams skyrocketed. At an experimental site near Lake Bonney the moisture went from bone dry to underwater (from less than 1 percent grams of water per gram of soil to about 15 percent g/g). What was more surprising was that now, a year later, the soil still contains some of that water, about 5 percent g/g, even though it's a much cooler, drier season.

"The soils are still pretty wet in places they were inundated last year," said Jeb Barrett, an ecosystem ecologist from Dartmouth College, who said the residual water showed up 1.5 to 2 inches (4-5 cm) below the surface.

Quite unexpectedly, a site on a hillside on the south side of the Fryxell Basin, away from streams or lakes, had a similar response to the warming, becoming damp though there was no visible source of water. The water at that site likely came from subsurface flows, as permafrost melted and drained downhill, something almost unheard of in the valleys, said Barrett.

The water at F6 had an aphrodisiac effect on one of the three species of nematodes, the *Eudorylaimus antarcticus*. A year later their population has quadrupled, having gone from about 15 organisms per kilogram dry soil to 65 organisms, and almost all of the population increase comes from young nematodes.

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Photo by Ian Hawes/Special to The Antarctic Sun

At left, diver Ian Hawes prepares to go under the ice on Lake Hoare. While he's submerged, Maria {} talks to him from their dive shelter. On the lake bottom he finds beds of algae, which he samples and takes back to the lab, right.

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"It's like all these kids at the beach at F6," Wall said. "It's like spring break."

The sudden rise in *Eudorylaimus* is particularly interesting because it changes the mix of species. Usually *Eudorylaimus* are in the minority and the soils are dominated by another nematode, *Scottnema lindsayae*. But the water at F6 actually decreased the number of *Scottnema* overall at the site.

"We're seeing a change in the demographics of the nematode community," Wall said.

A similar drop in *Scottnema* and increase in *Eudorylaimus* occurred at the Lake Bonney site. At that site, the third species, the typically aquatic *Plectus antarcticus*, also suddenly appeared in greater numbers.

Though the changes are linked to the water, Wall is pretty sure there's more going on. She's added carbon to soil plots before and seen the nematode population increase. The movement of water would have mobilized soil solutes and nutrients with it, Barrett said.

"Last year was a very unusual year and for me it kind of reshaped how I think the system works," Barrett said.

> "They've talked about these fabled melt years in the past."
>
> —Thomas Nylen, glaciologist

Buried ice exposed

"Normally you can tiptoe across the Onyx in rubber boots," said Ron Sletten, a researcher from the University of Washington.

But last year the water was thigh deep in Antarctica's largest river and Sletten duct taped his pants to his boots to try to keep the water out as he waded across. He watched processes that usually take years occur before his eyes, as the Onyx River dug a deeper channel through the Wright Valley and eroded away the banks.

"It was pretty wild, because when I was there everything was actually moving — contraction cracks were opening and polygons were falling into the Onyx," Sletten said.

He'd been speculating there might be ice below the polygonated terrain in the Wright Valley similar to the buried ice he studies in the Beacon Valley, because the valleys have the same kind of characteristic undulating terrain. Digging into the frozen ground to find ice is generally difficult, but Sletten didn't need to. The high water answered his question, as cracks 10 to 13 feet (3-4 m) deep opened up, revealing ice below. More ice was exposed as the Onyx undercut its banks 20 feet (6 m) down to the base of the ice, showing the strands of dirt, sand and rock running through the ice.

"It was quite unusual and the exposures that became available were phenomenal from my viewpoint," said Sletten, who set up a ladder in the river to take samples from the bank. "I was just amazed when I saw that area."

What became the heaviest flow on record, with 17.1 million cubic meters of water, followed the lowest flow season of 200,000 cubic meters. With the warm temperatures, the permafrost itself melted down, causing water and mud to pour out the sides of the streambeds.

"In an area where groundwater isn't in existence, it's an interesting phenomenon for sure," said Chris Jaros, a graduate student at the University of Colorado measuring the stream flow.

Now that the Onyx has unveiled the ice below the Wright Valley, Sletten can begin comparing it with the Beacon Valley to better understand the processes that create and regulate ground ice.

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Valley gallery features the works of a master stone-carver

Above Lake Bonney is a natural sculpture gallery of rocks with polished sides and sensuous curves.

It's tempting to guess the artist. The one with a hole like a portal to the sky is reminiscent of Georgia O'Keefe's almost abstracted paintings of bones in the desert. Is that a chicken by Picasso sitting on a nest of stones? And what potter shaped the fragile curve of this bowl?

The artist was indeed a true master – the wind alone. Its tools were grains of sand and ice blasted against raw rock for thousands of years to create the ventifacts.

"Over eons of sand transport the sand abrades and polishes the surface," said Jack Gillies, a geomorphologist from the Desert Research Institute doing work in the valleys. "It is a record of historical wind patterns."

Ventifacts range from the size of a pinky finger to cottage-sized ones large enough to crawl inside. The classic ventifacts in the valleys are pyramidal in shape, their many flat faces meeting in crisp angles and polished to a soft black luster.

The more fanciful shapes, resembling turtles, elephants, birds and spaceships, are generally a collaboration between the wind and a salt weathering process called tafoni.

"The salt gets into the little pore spaces and eventually the crystals grow," Gillies said. "It's a mechanical weathering and the wind-driven sand comes along and adds its bit to the sculpting process."

For the wind to carve ventifacts it requires the right canvas, someplace where the rock is exposed to heavy and constant wind without snow. Besides the valleys they are commonly found in the Mojave, Sahara and other deserts.

The ventifacts in the valleys are still works-in-progress, as the wind continues to sand them into shape.

"I would think it's still going on here, especially in the wintertime when the winds are the strongest," said Gillies.

Natural sculptures formed by weathering decorate hillsides in the Dry Valleys.

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Lakes on the rise

Water pouring from the glacial streams raised the valley lake levels last season, making up for a decade of slow shrinkage in a few months. The moat around Lake Hoare grew too big for the footbridge that spans what is usually a 6-foot band of water, so a skiff was launched. The streams branched into new channels, pouring over to create a pond below the main camp building. About a meter of meltwater covered Lake Vida last year and at Lake Bonney, icebergs floated in the moat.

"It took a long (time) to drop the lake level and it took one summer to go up," said Peter Doran, a University of Chicago researcher studying the lakes.

At the same time, the warm weather and 24-hour sunshine thinned the ice covering the lakes. The ice over Lake Hoare and Fryxell is about 20 cm thinner, Foreman said. The dramatic thinning followed 15 years in which the lake ice covers thickened about a meter on average, Doran said.

"The last four years that I'd been here I'd seen it gradually thickening," Foreman said.

Last summer Priscu's limnology research team had to haul their equipment across the lake on foot to take water samples for fear of losing the all-terrain vehicles to the lake. Foreman and Jill Mikucki fell through themselves, up to the waist in frigid water. The last time Priscu remembers conditions like that was in 1984, when it was almost impossible to walk across the lake ice.

The samples of lake water they're taking back to Montana State University this year should show how the strange weather affected the lake's chemistry and microbial life. Back in the lab they will compare the background chemistry and phytoplankton production with data from the past 13 years, Priscu said. They expect an increase of phytoplankton carbon in the lakes as a result of nutrients swept into the lakes by the streams. The nutri-

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After getting up at 4:30 a.m. to collect samples of lake water, members of the limnology team cook a large breakfast. Christine Foreman stirs hashbrowns while Tucker Stevens watches.

Hot cuisine in the valleys

Food storage is usually a pretty simple matter for most remote Antarctic field camps – just bury it outside and it should stay safely frozen for years.

Not in the Dry Valleys.

Researchers headed there have to deal with a unique possibility of above-freezing conditions and no place to store perishables when planning their menus. As a result, they stock up on a lot of items other teams pass over.

"They take dried hash browns as opposed to frozen and they'd be more careful with taking fish," said Deborah Baldwin, coordinator of the food room at McMurdo Station where field teams get supplies before heading out. "If they can avoid taking much frozen food they would do that."

Many of the most popular staples – chocolate, oatmeal, pancake mixes, and various canned and powdered drinks – are safe. But crowd pleasers like steak and frozen vegetables – which may get served after spending a season or two under the ice elsewhere – definitely aren't as prominent here.

That's not to say some people haven't tested the limits of longevity when it comes to eating in the valleys. Peter Webb, an Ohio State University professor who participated in an expedition during the late 1950s, said they ate a lot of military food left over from the Korean War.

"It was already three or four years (old) and pretty awful," he said.

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ents, combined with more light from the thinner ice cover, should lead to an increase in primary production.

"This is kind of the year to see the effects from last year," Foreman said.

Some changes underwater were already apparent to Ian Hawes as he scuba dived into Lake Hoare in December to retrieve samples of algae from the bottom.

"One thing you notice is the ice is more transparent and there's more dusting from sediment from above," Hawes said.

The transparency of the ice covering determines how much sunlight makes it to the bottom, filtered through 15 feet (4.5 m) of ice and another 49 feet (15 m) of water. The algae mats grow in the shallow areas, before the murky light fades to black. Underwater, Hawes uses a plastic spatula to scoop up chunks of the algae, which look like thick beds of moss, and seals them into plastic food containers.

The algae grow up in layers, each year covering over the one before, so Hawes can look at the layers as one would growth rings on a tree. In about an inch of mat he finds 11 layers, plus six more compressed under-layers that have lost their pigment, representing 16 years in all. This year's layer appears particularly thick.

"You can see there was actually a really good growth year last year and a lot of sediment," Hawes said. "Those two things go together."

The sediment is dirt that had blown onto the surface of the lake ice and worked its way down. Each summer the dark specks absorb sunlight and warm up, melting a little farther into the ice. With so much warmth and sunshine last year, more of the lake ice melted and released a shower of dirt into the lake, providing nutrients for the bacteria below. Strands of the long "pinnacle" bacteria are traced back into holes where they attach to a grain of sediment that seeded the lake years before.

Last year the streams also carried sediment into the moats. There was so much sediment in Lake Hoare the divers couldn't see their hands in front of their faces. At Lake Vida, where the ice covering is so thick the streams flow over it rather than into it, about 6.5 feet (2 m) of dirty water pooled and later froze over the 59 feet (18 m) of lake ice. That helped Doran interpret the layers of sand he has found in ice cores taken from Lake Vida.

"That was the real kind of lightbulb moment," Doran said. "We initially thought of this as being wind-blown sand, but now know it is turbid water that flows on top during these flood years."

The sand layers appear mostly in the top five meters of the lake ice, indicating they have been more common in recent history, Doran said.

"Maybe these pulses are really important pulses of nutrients," Doran said.

Picture of the past, or future?

Researchers in the valleys think last year's warm spell was a normal variation in the weather; the kind of occurrence they've seen hints of in things like the bacteria growth layers and dry stream banks. About 15 years ago there was a similar high-water year in the valleys.

"They've talked about these fabled melt years in the past," Nylen said.

Since then the valleys have become colder, as has all of Antarctica except the peninsula. Last year was so hot it almost negates the trend.

"It may make the Dry Valleys so there's no trend, no warming or cooling," Doran said.

Just a slight change in temperature has huge effects on the valleys, where water is often right on the edge of freezing or thaw-

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Photo by Jenny Baeseman/Special to The Antarctic Sun

Photo by Kristan Hutchison/ The Antarctic Sun

Bird walks south to certain doom

Last seen, Charlie was waddling past Lake Bonney, away from water and food and toward certain doom.

To get that far the Adelie penguin had to pass the mummified carcasses of seals that had come that way before him, but he wasn't dissuaded from his purpose, whatever that was, said Jenny Baeseman, a member of the team studying stream algae in the valleys.

"He was walking pretty fast," Baeseman said.

Penguins and seals occasionally venture up into the Dry Valleys, where they inevitably die. The seal carcasses mummify in the desert climate, but the penguins disappear, picked apart by skuas.

Why the penguins do it is a mystery.

"Young birds wander around a lot investigating things," said penguin researcher Dave Ainley. "They're the ones that are responsible for finding new places."

Most of them wander just 6 to 9 miles (10-15 km) from the colony at Cape Royds, but a few adventurers keep going. A handful make it to McMurdo, or even Pegasus ice runway, where several were seen last week. Then there are ones like the poor penguin the stream team named Charlie.

"The ones that get to the Dry Valleys are just kind of on the outer periphery of wandering; the edge of the bellshape curve of wandering," Ainley said.

Photo by Jenny Baeseman/Special to The Antarctic Sun

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ing. The lakes have risen and fallen in reaction to temperature changes of only a degree or two, Lyons said. About 1,000 years ago Lake Fryxell was almost dry, just a meter deep. Now it's 18 meters deep.

Doran compared current views of the lakes with historical photos and descriptions, all the way back to Scott's 1903 journal. Since 1911 Lake Hoare has risen about 10 meters, Doran said.

"There's quite a bit of land that's been submerged," Doran said.

But everything's relative. Look even farther back, about 10,000 to 40,000 years, and the entire Taylor Valley is believed to have been filled with a huge lake, called Lake Washburn. At the time, the other valleys were also lake-filled. But strangely, this highest watermark was hit during an ice age, Fountain said. Those large lakes left behind carbon and other nutrients that are still supporting life, Priscu said.

The high water last year may help explain some of the smaller ups and downs in the sometimes wet, sometimes dry, valleys. While the lake levels fall gradually, as the ice sublimates or water evaporates, last year proves they can rise swiftly, sometimes meters in one season due to a flood, Priscu said.

"It's kind of given us a little picture of what maybe could happen, what conditions caused that (lake rise)," Nylen said.

Visit

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Committee. He said he is encouraged by what he saw.

"You don't see a lot of frills," he said during an interview at McMurdo Station. "You don't see a lot of unnecessary expenditures. But you do see a commitment to sound science by a group of dedicated, committed, very enthusiastic people."

The most important part of the trip, Boehlert noted, was inspecting the progress of construction at the new $150 million South Pole station, scheduled for completion in 2007.

"The good news is that while weather over the years has forced some construction delays, the project is on budget," he wrote in an online journal of his trip. "That's a tribute to the planning and professionalism that is evident here."

The diversity of science projects surprised some lawmakers, as did the sophistication of research possible in harsh conditions with relatively primitive equipment. The data Antarctic researchers provide on controversial issues such as the ozone layer and global warming is also vital, Boehlert said during his interview.

"Congress is prone to say repeatedly ad nauseum that we want to operate on science-based fact, rather than speculation and theory, but sometimes when the science leads us to politically inconvenient conclusions then there's a tendency on the part of some to go in another direction," he said. "But it's hard to argue with a fact that's been methodically and meticulously developed over years of in-depth study."

Lawmakers also praised the abilities and attitude of support workers.

"I met a machinist today who's always having to create something someone needs for their work," said Rep. Nick Lampson (D-Texas). "They'll draw a picture of something and bring it to him. That's art."

Several said additional efforts to educate people about the program – and promote science education in general – should be made to ensure its future success. Rep. Roscoe Bartlett (R-Md.) drew some of the loudest applause at a McMurdo reception one evening when he called science "seed corn for industry" and stated "we've got a big job in education to do" when it comes to making people aware of that.

"As a major industrial power we're not investing anywhere near enough of our resources in basic science," he said.

The congressional members also used the trip to promote a bill signed by President Bush on Dec. 19 authorizing an increase of NSF's budget from $4.79 billion in fiscal 2002 to $9.84 billion in fiscal 2007. The funds are not guaranteed since authorizing funds is not the same as actually providing them – that occurs annually in the budget – but Boehlert said the impact will be substantial if the increases are implemented.

Photo courtesy of Sherwood Boehlert

Rep. Sherwood Boehlert tours a field station in the Dry Valleys with Bruce Marsh, a scholar and scientist from Johns Hopkins University.

"It means they won't have to have such a high 'sorry, no more funds' response to potential principle investigators who request financial support for research on an important subject with far-reaching implications," he said.

National Science Foundation Director Rita Colwell, who made the trip with the congressional delegation said she was pleased by the reaction of the congressmen to the Antarctic program, which she said should get its fair share of increased funds if NSF's budget is boosted.

"It means we can fund more of the science research," she said. "We can certainly complete the South Pole station."

Rep. Nick Smith (R-Mich), the bill's author, said it's likely at least some of the increase will fall victim to budget constraints as higher profile issues such as terrorism, a possible war with Iraq and a nuclear policy dispute with North Korea take priority.

"Probably we're not going to be able to meet that commitment in appropriations," he said. "So you've got to look for a way to achieve efficiencies."

But Smith said the calls for greater efficiency are not because he expects any reductions in U.S. Antarctic Program's funding as Bush and the Republican-led Congress pursue their budget goals.

"As best as I can see right now a lot of the research done down here is unique and can't be done somewhere else," he said.

The final two years of increases are contingent on NSF making "successful progress" in meeting management goals involving human resources, competitive sourcing, and improved financial and budget performance. Boehlert said the agency is well-regarded by many right now in terms of budget management.

"That's not just the Science Committee, which sometimes acts as cheerleaders for the NSF," he said, "but the Office of Management and Budget evaluated all the federal agencies, and the only one that they gave the green light to – under a program where you had a green light for outstanding, caution for some concerns and red for needs to improve – the only one they gave the green light to was NSF."

Boehlert said he hopes a large part of any increase in NSF funding will go toward education at the elementary, secondary and community college level, as well as lesser-known college programs. He said the bulk of previous funds have often gone to "prestige" institutions like Ivy League universities.

"That's well and good. They are outstanding and they deserve to have a lot of resources funneled their way," he said. "But what about all the rest, where there is greatness or potential greatness? I want them to have their principal investigators funded."

Talking to investigators and others at remote field camps in the McMurdo Dry Valleys was the best part of the oversight trip, Boehlert said.

"We talked not only to the leaders, the principal investigators, but also to some of the graduate students working on the projects, and to see the high degree of enthusiasm and the excitement of being a part of it all," he said. "Most people, quite frankly, go about their daily work at a much lower level of enthusiasm. It's a way to make a living. I think the people here view it as a way to do something of significance and, by the way, it brings in a paycheck."

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Rep. Sherwood Boehlert's online journal of his trip to Antarctica can be found at http://www.house.gov/boehlert/antarctica.htm

An interview with House Science Committee Chairman Sherwood Boehlert

'You can't just read about it'

The following are excerpts of an interview with Rep. Sherwood Boehlert (R-N.Y.), chairman of the House Science Committee, conducted at McMurdo Station on Jan. 16. He and six other members of the committee conducted an oversight trip to examine the $1 billion worth of U.S. Antarctic Program facilities on the continent and construction of the $150 million elevated South Pole station. The full text of the interview can be read at The Antarctic Sun's Web site at http://www.polar.org/antsun

Q: Can you explain the purpose of the delegation's trip to Antarctica?

A: It's not good enough for us to sit back in Washington and just read reports that the National Science Foundation provides us, although we have the utmost confidence in NSF and appreciate that it is unquestionably one of the best-managed agencies in the federal government...I felt it was important, as my predecessors as chairman have throughout the years, to bring a delegation down here to see for ourselves, to kick the tires so to speak.

I'm just favorably impressed. Some of the most important and sophisticated research with universal applications is conducted here under the auspices of the National Science Foundation (in) some of the most remote and sometimes primitive, yet functional, facilities...The other thing that impresses me is the enthusiasm, the dedication, the commitment of the people working here. This is hardly the glamour spot of the world. It doesn't rival Club Med, but everybody appreciates the importance of being here.

Q: The stated purpose of the trip is an oversight visit. What are you hoping to see in terms of accomplishments and how do you evaluate if you're getting good value for your dollar?

A: By the results. First of all let's take something very practical and easy to evaluate: the major construction program at South Pole Station. We go down and see it, get briefed on it, look around, have an expert tell us what's being done, why it's being done, why they're doing it. That's important. You can't just read about it; you have to see it for yourself. If you read about it they can tell you one thing when you're reading about it in Washington, but if you're out the field it might be another thing altogether. It might be misrepresented. Or finessed in some way.

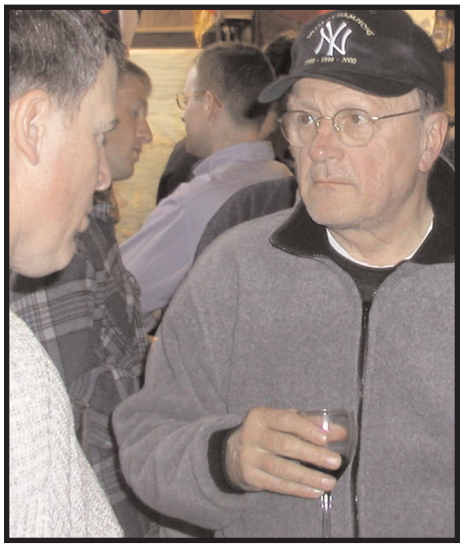

Photo by Mark Sabbatini/The Antarctic Sun

Rep. Sherwood Boehlert discusses the U.S. Antarctic Program during a reception for a visiting congressional delegation at McMurdo Station.

Q: Republicans gained control of Congress during the mid-term elections, allowing them and President Bush control of the political landscape for the next two years. Do you see anything happening as a result that might impact the U.S. Antarctic Program?

A: Just three weeks ago President Bush in an Oval Office signing ceremony put his signature to our Science Committee-resolved legislation to put the National Science Foundation on a path to have its budget doubled over the next five years.

Q: What will be the impact of the legislation?

A: It means they won't have to have such a high 'sorry, no more funds' response to potential principle investigators who request financial support for research on an important subject with far-reaching implications. It means that more fellowships – stipends – will be available for graduate students. It means for the very beginning, K-12, more resources will be devoted to science and math education across America.

When I first got in the committee 21 years ago there was virtually nothing for K-12 education. Community colleges were not eligible for assistance. Essentially the bulk of the resources were going to the same old schools, with prestige-laden distinguished Ivy Leagues and Stanfords, the like, and that's well and good. They are outstanding and they deserve to have a lot of resources funneled their way. But what about all the rest where there is greatness or potential greatness? I want them to have their principle investigators funded. It means we'll be able to do more of the same and the same is so exceptional that we should want more of that.

Q: Do you see any changes you'd like to see made in the U.S. Antarctic Program?

A: You can't bring about change as a result of 96 hours of examination and inspection, but that lays the foundation for a more in-depth analysis of wants and needs when we begin the process of dealing with next year's budget request.

Q: What do you consider to be the most significant thing you learned about Antarctica during your visit?

A: The fact that this vast area is a natural laboratory for so many and so varied research and pursuits.

Q: What was the best part of the trip?

A: I suppose people expect me to say the South Pole, but I think today was the best part of the trip because we got out to the field stations in the Dry Valleys and other places, and went from one to another and got a brief overview of what was being done, and then we talked not only to the leaders, the principal investigators, but also some of the graduate students working on the projects, and to see the high degree of enthusiasm and the excitement of being a part of it all. Most people, quite frankly, go about their daily work at a much lower level of enthusiasm. It's a way to make a living. I think the people here view it as a way to do something of significance and, by the way, it brings in a paycheck.

Q: Any other thoughts about your visit?

A: One of the things I want to do is encourage more of my colleagues to come down here. I want them to see for themselves and begin to appreciate what's done here and why it's done and how it's done here, to see this vast wildness in its majestic splendor. It's absolutely breathtaking the beauty of it all. It's at once very sophisticated and yet very primitive.

Profile

Building a "green" house

Greg Lehman leaves the Ice for an earthen home

By Melanie Conner/*Sun staff*

One year and 11 months ago, he dug his first trench. One cob and two strawbale walls later, Greg Lehman talks about harvesting water reed to make the roof of his "green" house.

However, it's not the kind of greenhouse with hydroponic plants that grow year-round leafy vegetables and flowers. Instead it's a house made of natural materials from clay and straw to water reed.

"It's not like your average house. It's fairly exotic in nature," said Lehman, who describes his earthen house as a departure from his childhood house.

"I grew up in suburbia," said Lehman, kitchen steward at McMurdo Station. "I was only familiar with suburbia-style houses."

After waxing his creative side in college by studying jewelry making and taking a class in drafting and design at a liberal arts college in Indiana, Lehman knew he wanted to build his own house one day.

His house plans turned green only a few years ago after working with the Envirocorps group for a year where he learned about strawbale construction.

While Lehman may have wanted that day to come a little sooner, 10 years after its first conception Lehman broke ground on a piece of property in Goshen, Ind., his hometown.

In preparation for building his house, Lehman has attended workshops and classes around the country from Berkeley, Calif., to Maine, learning skills ranging from earthen-wall building to designing.

"I will contract out some work, like electricity, but the plumbing will be easy," he said "I already know how to solder. I learned that from making jewelry."

At home, his schedule consists of working throughout the day, sometimes alone, sometimes with friends, and reading in the evenings about building techniques and troubleshooting.

"I've never worked construction before. It's all been book learning and workshops," said Lehman. "This is the test house and I'm learning a lot," he said.

So far his studying has paid off and his inexperience hasn't prevented him from erecting his first walls of strawbale and cob last summer.

"(Cob walls) are monolithic walls made of a mixture of clay subsoil and straw," said Lehman. "It's a traditional technique in England and Yemen."

To prepare his mixture, Lehman laid down a ground tarp and mixed ingredients using the foot power of his friends to mimic the tradition of using oxen and human power.

"I had 15 people there for a week to mix the clay and build the wall," he said. "Then I said 'to hell with this' and used a Bobcat loader."

As for procuring materials, Lehman mostly just asks local farmers about their availability and prices of straw, stones, dirt or water reed. Then he hauls it to his place in his extended cab, long bed, Chevy pick-up truck, equipped with a utility crane capable of lifting 1,500 pounds.

Lehman's goals are coming to fruition because of his time spent working at McMurdo Station.

"This is the means to the end right here," said Lehman. "The last three years I've been coming down only with the goals of building my house back home."

Working in Antarctica has allowed him to get the project off the ground, by freeing up some time and saving money.

His first experience in Antarctica began in 1997, when he worked as a general assistant at McMurdo Station. Since then, he has worked in recreation, cargo and the dining hall.

"The first year here, I learned that I enjoy doing physical manual labor. I don't want to go to a gym and work out. I'd rather do physical work to stay in shape."

"I worked in cargo one season and it taught me how to drive loaders and machines," he said. "It gave me the confidence to dig a hole on my property myself."

After spending six seasons on the Ice and making headway on his house, Lehman has drafted other goals as well.

A house is not all that Lehman intends to build, but he also wants to build a niche in what he hopes will be a burgeoning market – consulting other environmental home builders.

Lehman started a four-week lecture series at McMurdo about sustainable living and building green. His ideas and skills have allowed him to meet other people with similar goals, with whom he can share ideas and talents.

"This year several people have expressed an interest in having me help them," said Lehman. "I feel like I want to be doing this for the next 30 years."

Greg Lehman sets a strawbale onto the founda - tion of his home in Goshen, Ind. He is building the house using environmentally-friendly methods and materials.

Photo by Tim Braun/ Special to The Antarctic Sun

"This is the test house and I'm learning a lot."

- Greg Lehman