



Lake Vostok's future debated

When and how to drill large frozen lake in search of prehistoric life

By Kristan Hutchison
Sun staff

Cold war has a different meaning for Antarctica, where international scientists are in a standoff over what to do with Lake Vostok.

Lake Vostok's size, age and secrets have captured the interest of scientists and the general public since it was recognized in 1994. The lima bean shaped-lake is more than 155 miles (250 km) long, distinguishable from the surrounding terrain because it is a smooth stretch between the sub-ice mountains and the low plateau.

"If the space shuttle flew over Antarctica, it would be probably one of two features you'd pick out," said Robin Bell, a scientist creating a model of Lake Vostok based on data collected last year.

Covered by ice for perhaps 15 million years, that lake doesn't even know about the last four ice ages, Bell said.

But it's about to meet the 21st century.

The expansive, ice-covered lake is in a precarious and tantalizing position. The Russians have already drilled 11,886 ft. (3,623 meters) into the protective shell of ice that covers the lake. Their hole is poised a few hundred meters above the liquid water.

Scientists are curious to study a sample of the lake water itself, but disagree on when and how it should be done. The Russians who originated work at Lake Vostok want to keep inter-

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Down in the dishpit



Photo by Melanie Conner/The Antarctic Sun

Mike Toomey, dining room attendant, and Sarah McNulty, general assistant, wash dishes in the galley together at Amundsen-Scott South Pole Station. McNulty says that washing dishes can be a nice break from her usual duties of shoveling snow in below freezing temperatures outside. Read the weekly Pole report on page 5

Causes for the common crud

By Kristan Hutchison
Sun staff

Chocolate cravings, skipping showers, groggy mornings - Antarctica provides medical excuses for these and more.

The cold, dry, and constant light or darkness cause a number of changes in the human body, some obvious and others insidious.

A 1999 Italian study of an expedition in Antarctica found the members experienced a 31 percent drop in magnesium, causing stress, nervous breakdown, insufficient sleep, irritability and anxiety.

The remedy? Chocolate.

Or bran, dried fruit and cereals, but what

kind of a choice is that?

A better diet has solved many of the ailments early explorers faced. Scurvy, a sometimes fatal deficiency of vitamin C, is no longer a risk with juice on tap in the dining hall and fresh vegetables growing in the greenhouse. The high numbers of cavities and tooth cracking seen in Antarctic personnel 30 years ago has been solved with better dental hygiene and less frozen food.

Yet nobody's figured out how to compensate for the loss of the normal dark and light, day and night cycles. The sun's constant presence or absence wreaks havoc with

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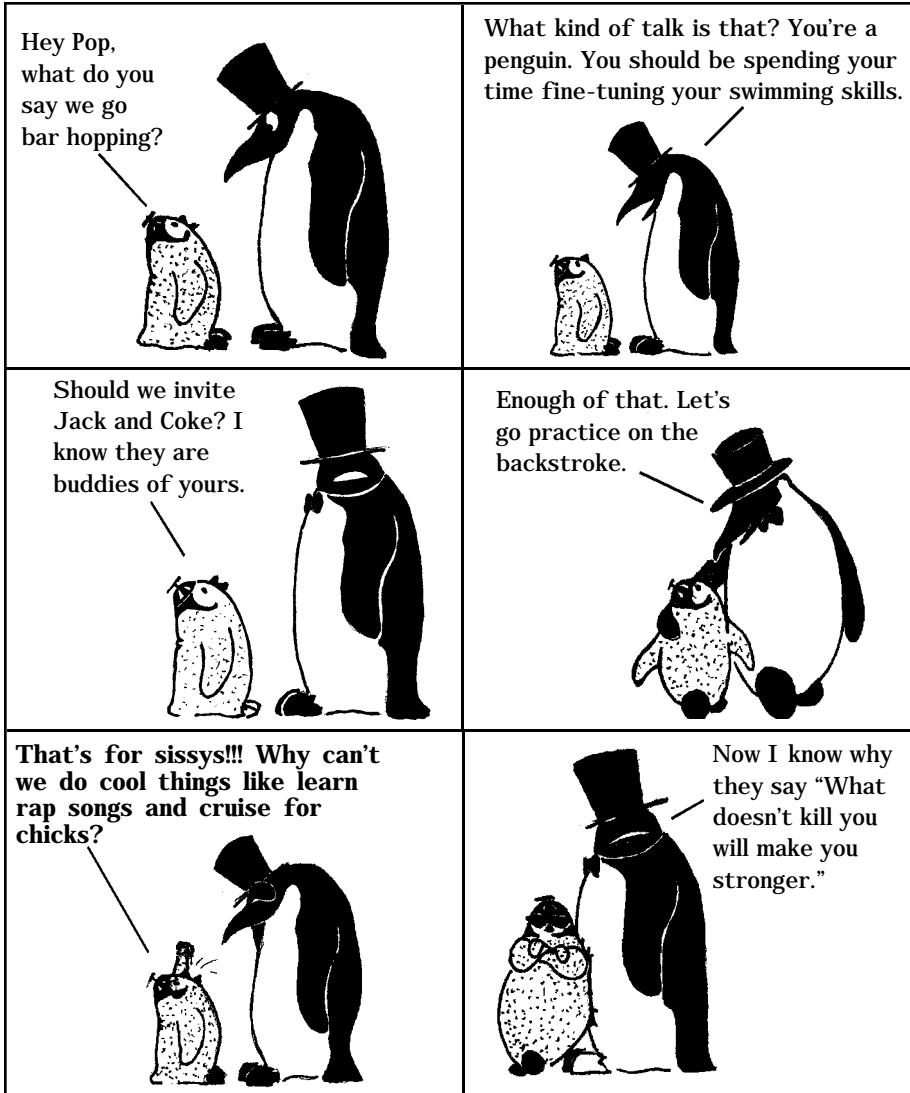
Quote of the Week

"I like it when you can drink a beer outside and it gets colder as you drink it."

- Man enjoying a beer in the South Pole Dome

Ross Island Chronicles

By Chico



Cold, hard facts

Taking the cold

- Weddell seal body temperature: 99F (37C)
- Killer whale body temperature: 97.5F (36.4C) to 100.4F (38C)
- Penguin body temperature: 101F (38.5C)
- Air temperature at which penguins overheat: 95F (35C)
- Penguin stomach temperature after a meal: 63F (17C)
- Average annual temperature of McMurdo Sound: 28.65F (-1.86C)
- Temperature at which some Antarctic fish freeze: 28F (-2.2C)
- Temperature at which they die of heat: 42.8F, 6C
- Body temperature below which a human is hypothermic: 95F (35C)

Underwater Field Guide to Ross Island & McMurdo Sound, SeaWorld/Busch Gardens Animal Information Database, Australian Broadcasting Corporation

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Words from the world of weather

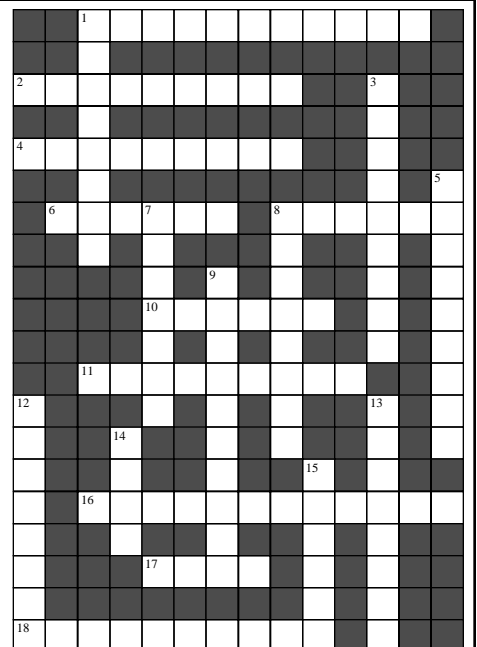
Answer on p. 10

ACROSS

- 1) Ocean current that flows 'round the continent
- 2) An abrupt change in wind speed or direction
- 4) How to tell if you're under pressure
- 6) White fibrous clouds made of ice crystals
- 8) Hurricane with blizzard-force winds
- 10) A chilly version of the Celsius scale
- 11) Degrees+mph=_____
- 16) Weather could be better, could be worse
- 17) The Ice's prime weather influence on human activity
- 18) Low pressure, yet still called this

DOWN

- 1) Trail of ice crystals produced by aircraft
- 3) Downflowing winds caused by icecaps
- 5) Heat+humidity=_____
- 7) A chilly version of the Fahrenheit scale
- 8) The amount of water vapor in the air
- 9) Water droplets changing to ice crystals
- 12) Strong wind and falling/blowing snow
- 13) When shadows and contrasts disappear
- 14) Curse of GAs; shelter of the stranded
- 15) A unit that measures atmospheric ozone



Weathering the Future

Forecasters find a better crystal ball

By Mark Sabbatini
Sun staff

Call it a gift from technology: A more accurate weather forecast covering a longer duration of time.

It made this year's first-ever winter medical evacuation at the South Pole possible. It's helping Antarctic weather officials overcome a scarcity of observation sites and historical data. And observers of the continent's weather worldwide rang up nearly 80,000 "hits" during the past month on the system's Web site.

Those accomplishments, made by a specially designed computer forecasting system put into service a year ago, highlight the progress of observing the harshest climate on Earth, according to those who designed and work with the system. Future projects, they say, will assist not only those gathering data about and from the Ice, but help further determine the continent's influence on weather elsewhere in the world.

The key to the year-old Antarctic Mesoscale Prediction System (AMPS) is weather modeling that provides images and other data in much greater detail than previous systems, said Bill Kuo, head scientist for the group that developed the system. The system - a version of which is used worldwide - is also specifically tuned for the continent's atmosphere.

"There are some interesting challenges with doing forecasts - unique topography, unique surface characteristics," he said from his office in Boulder, Colo. "Many of the weather prediction models have been developed based on the data over main latitudes."

Perhaps the most noteworthy role of the AMPS system to date is April's medical evacuation of Ron Shemenski from Amundsen-Scott South Pole Station. A



forum on Antarctic weather in Washington, D.C., on Sept. 10 featured several speakers who referred to the rescue, and how forecasters and pilots were able to get a special five-day forecast and other weather statistics for the area.

"They found that they provided enhanced detail and reliability in some key forecast parameters for that rescue mission, mainly wind velocity and wind direction over the South Pole," said Jordan Powers, a scientist at the National Center for Atmospheric Research in Boulder. "So that - the success of that effort to bring back Dr. Shemenski safely - represents a real concrete payoff from some of the investment that the National Science Foundation has made in science, technology and specifically in supporting computer weather forecasting for the Antarctic."

Users of AMPS - from forecasters in Antarctica to casual Web surfers - can examine graphs and animations of data such as temperature, wind speed, humidity and precipitation at various altitudes and times. A pilot, for example, can study how wind speed and direction change with altitude and accurately determine wind shear at Williams Field near McMurdo Station. The increased detail of the new system allows a closer - and therefore more accurate - examination of such areas.

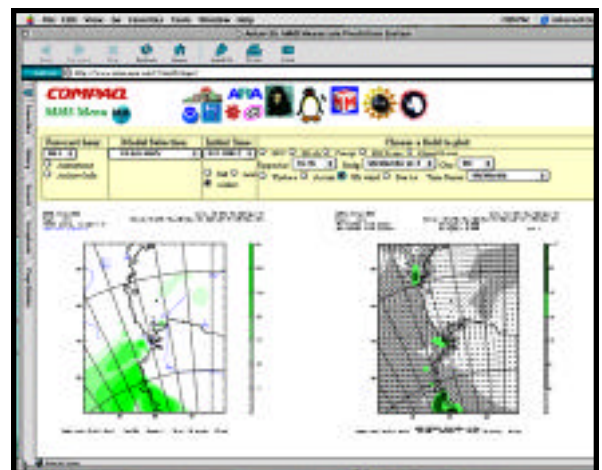
The system was designed by the National Center for Atmospheric Research in Boulder and the Byrd Polar Research Center at Ohio State University, and funded by NSF. It can be found on the Web at www.mmm.ucar.edu/rt/mm5/amps.

One of the main advantages of modeling is it takes away much of the guesswork of forecasting, said NSF

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Old and new: A collection of weather instruments pieced together over the years, left, are scheduled to be replaced when the new South Pole station opens. It is among many forecasting improvements being made in Antarctica, including the AMPS computer system, right, which allows anyone from forecasters to Web surfers to observe a variety of data.



... if you think about any molecule of air on our planet, it can be anywhere else on our planet within one month ...

Weather From page 3

Science Representative Bernhard Lettau. He said a forecaster in Kansas may be able to examine tornado clouds 40 miles away and make an informed prediction based on plentiful data and lengthy historical experience, but those aren't always available on the Ice.

"We're trying to use forecast models and make this more objective than someone saying 'It looked like this back in 1987 and we had four feet of snow the next day,'" he said.

Kuo estimates two-day forecasts by AMPS for Antarctica are accurate 85 percent of the time, compared to 90 to 95 percent in the mainland U.S.

"Over the Antarctic the main problem is you don't have the data," he said.

There are about 11,000 manned and automated weather stations in the U.S., compared to about 200 in Antarctica, said Art Cayette, USAP meteorology manager at McMurdo Station, at the September forum. He said U.S. forecasters also have other technical advantages in areas such as networking with each other and availability of global satellite data.

"We have a very brief history of what the weather is in this region and what amount of data that we've collected," Cayette said. "It's very scant in comparison with anyplace else in the world. We need to continue studies and open the door to improve numerical modeling and modeling techniques. Improved understanding of the Polar environment will influence conditions for the entire globe."

Some improvements are already in the planning stages.

A new system will be installed at the South Pole when the new station is completed, according to Dar Gibson, senior meteorologist at the South Pole station. In a recent e-mail message he stated weather stations are using "a variety of instruments that have sort of been pieced together over the years" to do their observations.

"The idea of the new system is to have an integrated 'suite' of proven, reliable and robust instrumentation that is capable of a certain degree of automated data retrieval and dissemination," he wrote. "The instruments would work with this system



The South Pole's weather data tower, above, is among a relative handful of collection sites scattered across the continent.

observations and evaluations of meteorological elements that are best observed manually."

As with McMurdo, there are unique factors to consider with equipment used at the Pole, Gibson wrote. Frequent blowing snow has caused static buildup with some instruments, he noted, and a near-constant fall of ice crystals has caused problems for optical instruments that measure cloud height and horizontal visibility.

Another proposed future project is the Ross Island Meteorology Experiment (RIME), which would focus on weather dynamics in the Ross Sea area over periods of time ranging from less than a day to a week. If approved by NSF, field research is scheduled to begin in 2003, with analysis continuing at least through 2007.

The goal of RIME is to continue improving the modeling for Antarctica, according to project planning documents. Understanding the dynamics of the Ross Sea, which is seen as representative for the rest of Antarctica, will help lead to a greater understanding of the continent's role in the global climate system.

Requests for more detailed data than AMPS currently provides are common, Kuo said. But he said the limitations of their equipment - a threefold increase in resolution would require 27 times more computing power - limits such improvements for now.

"It doesn't take much to eat up the computer time," he said. "So if we are going to do this we may have to be using in on very specific areas like McMurdo, but we would not be able to cover a larger area."

Progress already made shouldn't be overlooked, said David Bromwich of the Byrd Polar Research Center during his appearance at September's forum. He said it's almost humorous when people talk about limitations such as having only a handful of weather stations.

"I can remember when we had only one and, furthermore, we didn't have the satellite pictures either," he said. "So there's been a tremendous advance. It's all relative, isn't it? An important thing to realize is that Antarctica is not cut off from the rest of the world. In fact, if you think about any molecule of air on our planet, it can be anywhere else on our planet within one month approximately."



around the continent

PALMER

Ice blows out, opening the way for ships

By Tom Cohenour

Palmer correspondent

The wind in Antarctica is usually described as fierce or relentless. It can also be described as welcome. At least it was described that way at Palmer Station on Nov. 11th.

Early that morning an open water lead could be seen in the ice pack approximately two miles off shore. Strong north winds created turbulence in the water along the leading ice edge causing fractures to form in the ice.

Fractures turned into cracks and cracks turned into open water as geometric shapes of snow-laden ice pack became detached and were forced southward by the wind.

"Wind speeds hit 67 knots (58 mph)," said Kristin van Konynenburg, the station physician who also performs weather observations. "I could hardly stand up when I went to check the weather station," she added.

By late afternoon, the flagged walking route from Palmer Station to Torgersen Island was gone. Gone are the sampling holes shared by crab eater seals seeking air and scientists seeking water. Gone are the elephant seals who would lurch their massive weight across the ice in mighty heaves while others of their kind remained content in one place uttering their deep-throated gurgling barks.

Palmer Station is no longer locked in an unbroken sheet of ice. The wind direction may change and blow ice back in, but seeing the ice break up and move out was a welcome change and a psychological turning point. Wilson storm petrels seemed to

dance in the air enjoying the high winds. Boating II (on the water) class is being planned for early next week. And a few people are setting up their tents in the backyard towards the glacier in preparation for summer.

The research vessel *Nathaniel B. Palmer* paid a short visit to Palmer Station dropping off fresh produce, scientific equipment, and one passenger. Dr. James B. McClintock joins six colleagues conducting research on the Chemical Ecology of Shallow-Water Marine Macroalgae and Invertebrates (BO-022-O).



Photo by Laura Hamilton/Special to The Antarctic Sun
Open water appears at Palmer Station the morning after a storm broke up the sea ice and blew it away.

SOUTH POLE

Almost full house with construction and science

By Tracy Sheeley

South Pole correspondent

South Pole station continues to build up speed for the busy season. The population broke 200 on Nov. 13, and will remain over 200 for the remainder of the season. Our full-house capacity is 220.

Construction workers are laboring all over the place, both inside and out. Crews are working to finish the interior of the new station pod that was built last year. Our goal is to house people there this win-

ter - the beginning of the transition!

In addition, footers are being set for the next pod - the "snowscape" will be changing quickly this season. Our operations staff is pushing mountains of snow all over the place - clearing and making snow roads to everywhere Polies need to travel. They will soon begin on the road to SPRESO - the South Pole Remote Earth Seismic Observatory. SPRESO will be located nearly five miles out from the main station area.

In the vast world of science, things are ramping up. More scientists are arriving on every flight. A big newsflash for AMANDA (Antarctic Muon and Neutrino Detector Array) is that Congress has approved the first \$15 million appropriation for ICE CUBE - the next phase of AMANDA's research.

A fun perk of our smaller population is that guest chefs are welcomed in the galley. Last Sunday, we were all treated to a delicious Chinese meal, courtesy of Weilin Pan, a visiting graduate student with the LIDAR (Light Detection and Ranging) project.

SHIPS

Vessels delivering goods on the high seas

Facing 40-knot winds and 12-foot seas, the research vessel *Nathaniel B. Palmer* delayed delivering crew to open Cape Shirreff field camp a couple days. Instead the *Palmer* went to Palmer Station, dropping off luggage, freight and freshies. On Nov. 14 the *Palmer* tried again, this time reaching Cape Shirreff to open the camp.

The research vessel *Laurence M. Gould* arrived at Palmer Station Nov. 5 at the start of resupply cruise. The *Gould* delivered several scientists, including Charles Amsler's team, which will be studying marine macroalgae and invertebrates.

Correction: A photo run on this page last week was not properly credited. Katrina Siazik took the Halloween photo of Dean Klein.

the week in weather

McMurdo Station

High: 30F/-0.9C Low:3F/-16C
Wind: 50mph/85kph
Windchill: -45F/-43C

Palmer Station (Nov. 3-9)

High: NA Low: NA
Wind: 60mph/96kph
Precipitation: 0.8in/21mm

South Pole Station

High: -46F/-44C Low:-29F/-34C
Wind: 22mph/35kph
Windchill: NA



Perspectives Perspectives

NOT-SO-HAPPY CAMPERS

By S.C. White

A friend wrote me about the Snow School refresher course in McMurdo. She was disappointed that it was so short, and not as much fun as the snow craft training we call Happy Camper School. Fun? It is good training and you meet some good people, but fun? Not to anyone who has been stuck in the snow.

I told her about Traunstien. The 6th Infantry was a real spit and polish unit. In Berlin at the height of the Cold War, we were a combat unit. We were not a part of NATO but part of the Army of Occupation of Germany. Surrounded by two enemy army groups, 100 miles inside a hostile country, we faced real Russians with real guns and real bad attitudes. In order to maintain combat readiness, we trained in the "free zone," back when there were two Germans.

One November they sent us to Traunstien in the Bavarian Alps. Just like going to Happy Camper School, they wanted us to experience field operations in a cold-weather environment. What was supposed to be a week-long field exercise ended up as two weeks stuck in the snow - no down parkas, no Scott tents, no Whisperlight stoves.

We had Mickey Mouse boots, the same as bunny boots, only black. Otherwise, all we had were army-issue cotton uniforms - no insulated arctic Carhartts, just regular army field jackets. We were sleeping in pup tents that collapsed under the two meters of snow we got in four days. The weather was so bad it grounded all the choppers. When it wasn't snowing - a wet, sticky snow that fouled rotor blades - a thick fog laid still in the valleys making white-out conditions. The roads were worse, just muddy ruts between the trees. The "all-terrain" Gamma-Goats spun out on six wheels and sank deeper in the drifts. We had no snowmobiles, no Delta vehicles, no Hagglunds. It wasn't just a weekend trip a couple of miles outside McMurdo, we were there for 12 days.

Most of the medics were Vietnam vets. One got his combat badge in the

Dominican Republic, and 80 percent of the medical platoon was from California. What did we know about frostbite? Before our deployment, I had been assigned to train the battalion on cold weather injuries. It was supposed to be good training for me to do the research, write the lesson plans and deliver the information. No one thought we would actually use the training, which reminds me of Happy Camper School. Many people attend as a formality, so they can go on boondoggles. They should take it more seriously,

WHAT WAS SUPPOSED TO BE A WEEK LONG FIELD EXERCISE TURNS INTO TWO WEEKS STUCK IN THE SNOW - NO DOWN PARKAS, NO SCOTT TENTS, NO WHISPERLIGHT STOVES.

because the best cure is prevention.

At Happy Camper School they teach you that calories count. Fuel the body to burn calories and keep warm. In Traunstien, the freshies were frozen and we ran short of food. Later in the week a C-130 air dropped c-rations, kicking pallets out the door. Cartons scattered across the hillside for half a mile. The slope was so steep, we had to stop gathering food to rescue a squad caught in an avalanche.

Who can plan for something like that? Some people say "nothing ever happens" in McMurdo. We also thought "nothing ever happens," driving up the mountain near Traunstien. It turned out to be the worst alpine storm in years.

Some bright troops sat in their truck with the engine idling to run the heater in the cab. We found them unconscious from carbon monoxide poisoning.

We siphoned fuel for stoves in the mess tent. They weren't serving meals-they melted snow for water. It became our field hospital, since it was the only heated tent in the battalion. Now, I really appreciate the barracks in McMurdo. All I have to do is think of the alternative.

In Traunstien if you weren't hurt, you

stood out in the snow or stayed in your pup tent. Pup tents have no floor, and they get wet. Wet means cold. Not like the bone-chilling winds that sweep down from Minna Bluff.

You can build a windbreak against that. In Antarctica, you can dig a trench and a shelf bed with a cold sink, light a candle and roof it over, if you have enough time. We had lots of time in Traunstien, but the snow was different. Just below freezing, it was a wet and penetrating never-able-to-sleep cold. For two weeks, we were never dry. Antarctica is much colder than Traunstien, and a dry cold. With ECW gear, you can control body moisture as well as body heat. In Traunstien, all we could do was shiver up a sweat, which was wet, and even more cold.

One day I found some people unconscious under a truck. Building a shelter they had botched it; then, fell sleep, iced over and turned blue.

In Traunstien, no one had actually been to winter survival training. We put our heads together and came up with a shelter all the troops could use. We lived under the trucks. We stacked pine boughs for insulation and didn't worry about collapsing canvas. We put whole platoons to work and squads lived together. Another cold weather lesson: there's safety in numbers. You can group together for warmth. That's part of the reason they work in groups at Happy Camper school. We certainly would not have made it in the Infantry if we did not pull together. Another lesson for Antarctica - it is important to work together. To learn these lessons in cold environments and learn to work together in groups. Besides, you meet some great people on the Ice and that can make it fun.

Fun? Did I say that?

• • • •

S.C. White is a Raytheon Polar Services technical writer. He went through both Snow Survival School and then the refresher course during his deployments to McMurdo for the '97-98 and '98-99 seasons.

Tammie Thorpe, a med tech with the Air National Guard, takes Risk Miller's vital signs in the McMurdo clinic Wednesday. From 80 to 130 people come into the McMurdo clinic each week, mostly for upper respiratory infections or minor injuries.



Photo by Kristan Hutchison/The Antarctic Sun

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people's circadian rhythms, the internal cycles that determine everything from hormone levels and body temperature to hunger and sleep patterns.

"The result is that non-specific, lousy feeling," said Will Silva, who has served as doctor at Palmer, the South Pole and now McMurdo. "That is to some degree what happens to us or what we're susceptible to when we lose that light/dark cycle."

Restless, interrupted sleep is a common complaint for people summering at all three stations. In a 1991 study, two-thirds of the subjects reported sleep difficulties in Antarctica. Though the station was on the same time as their point of origin in New Zealand, the rhythms of their temperature, activity, and heart rate were delayed two hours.

"Insomnia is a problem, especially now that the light lasts so long," wrote the Palmer Station doctor, Kristin van Konynenburg. "Between the changes in light and sharing a sometimes overheated room with someone who may have a different work schedule, it can be hard to sleep for anyone. Most folks who make it a habit to sleep in a tent in the "backyard" report sleeping better once they spend a few nights in their own tent."

The sleeping problems link with other health problems too. The stress of constant light, along with stress at work, cause people to grind their teeth at night, noted McMurdo dentist Bill Servais.

"I have had to treat several dozen people for that who had no previous history of it, but were waking with sore jaw muscles or

their roommates told them they were grinding at night," Servais said.

In McMurdo, Silva occasionally prescribes sleeping pills to help people sleep easier, but only for the short term.

"Minor tranquilizers are useful for a few nights, particularly when the sleep disorders are related to minor angst, love or money usually, at home," Silva said.

For the long haul, the best cure is to avoid caffeine six hours before bed, moderate alcohol consumption and slow down in the evening, Silva said. Pull the curtains at night and read, listen to music or find another way to relax.

"Don't go dancing under the sunlight and then try to go to bed," Silva said.

On the other hand, the constant daylight helps shift workers transition from night to day and back again. A 1991 study at Halley Station found shift workers could readapt in one week in the summer, while it took three weeks in the winter.

The constant daylight keeps Brian Strain awake for the night shift at McMurdo Station, an advantage he didn't have when he tried going to night school in Colorado.

"That was a little tough," Strain said.

Strain nodded at the row of windows in the dining hall where he works.

"Being able to look out those windows and see daylight makes it a little easier," he said.

The winter dark has somewhat the opposite effect, slowing people down and putting them on individual sleep cycles. The changes in daylight, along with cold temperatures, also influence immune systems, thyroid and other hormone systems, according to a number of studies.

About 30 percent of people working in

Antarctica have altered immune responses, according to 10 years of research by institutions in the U.S. and Australia.

The National Space Biomedical Research Institute (NSBRI) has been studying immune system changes in Antarctic inhabitants with interest because they may be similar to changes that would be experienced in extended space travel. Studying winter-over residents, Dr. William Shearer found their immune systems were depressed, and there was some evidence that latent viruses were reviving to take advantage of the situation.

"All of us carry latent viruses for our whole life," Shearer said. The viruses are acquired early in our lives, sometimes after a mild childhood illness, and go undetected in our bodies.

"Most of us don't know about it... except when our immune system becomes weakened," Shearer said.

Then these latent viruses reappear. Shearer has noted some appearance of latent viruses infecting patients in Antarctica, including the virus causing infectious mononucleosis.

"There is evidence for reactivation of certain of these viruses, such as the Epstein-Barr virus," Shearer said.

The colds commonly seen when people first arrive at the stations are probably caught on the way here, wrote van Konynenburg. In preparing to come to the Ice, people wear themselves out doing a million little errands.

"People are generally pretty run down when they get on the plane," she wrote. "Then they breathe recirculated air in a

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Photo by Melanie Conner/The Antarctic Sun

A pilot sleeps aboard an LC-130 while en-route from Amundsen-Scott South Pole Station to McMurdo Station.

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tiny space filled with other people for hours on end. A great virus incubator!"

The stress and lost sleep continues after they get to the Ice, "and lo and behold, we wonder why our cough and sniffles aren't going away," van Konynenburg wrote.

Her defenses are zinc lozenges, a sleeping pill, neck pillow and blindfold on the plane, and trying to get a normal amount of sleep before she leaves on a trip.

Once a cold is caught, the dry air at all three stations prolongs cold symptoms and makes people more susceptible to viruses. While the dryness is most extreme at the South Pole, because of its very low temperature, people at all three stations experience dry skin problems. On some people dry skin itches, which leads them to scratch and create the appearance of a rash, said Dr. Silva in McMurdo. He recommends humidifiers, moisturizer and fewer showers.

"Showering every day in hot water with strong soap is bound to give you problems with dry skin," said Silva, who supports the twice-a-week shower limit at the South Pole for medical reasons.

The dry air also leads to nosebleeds, Silva said. The nose's internal lining creates extra mucous to protect itself. That cakes up and when regularly irritated causes bleeding. Silva advocates humidifiers by the bed and nasal saline solution. And no picking.

Saline solution and humidifiers also help people experiencing dry eyes, Silva said. Contact lens wearers sometimes have to switch to glasses.

The hands take the hardest hit from the dryness and cold, because they're more exposed than the rest of the body. Cracked skin on fingers, scrapes and other minor

hand injuries are common, and tend to heal very slowly, Silva said. It's a similar phenomenon to what he's seen on mountaineering trips in Alaska.

"They're cold. They're getting mechanically abused. They're dried out," he said.

At Palmer, Dr. van Konynenburg tries to keep Eucerin cream and Aquaquor in key places like the galley and the boathouse. Like other Antarctic doctors, she resorts to gluing hand wounds together to help them heal. At the South Pole last winter Dr. Carlisle ran out of superglue, and resorted to band-aids holding in a coating of moisturizing ointment. But the band-aids had to be fabric ones because plastic band-aids split and fall off in the cold, dry weather.

Dry air also saps the body quickly, leading to one of the most commonly prescribed cure-alls in Antarctica - drink more water. Van Konynenburg recommends it for fatigue. At the South Pole Dr. Betty Carlisle considers it an altitude sickness preventative.

"Lots of fluids to most people means two glasses of water. To us it means four quarts," Carlisle said.

The one injury people most associate with severe cold - frostbite - is unusual, even at the colder stations. People are seldom far from a warm building without plenty of clothes. At the South Pole, Silva saw minor cases in the first few weeks after people arrived, in the form of small brown patches on the face where a gap between the balaclava and face mask exposed the skin.

Even people joining the "300 Club," in which they go into the South Pole sauna at 200F (93C) and then run naked into minus 100F (-73C) weather, seldom get frostbite.

"People doing 300 Club will often come

“
*Don't go dancing
under the sunlight
and then try to go bed.*

”
*- Dr. Will Silva,
McMurdo Station*

running back in covering their pointy parts, whatever they may be," Silva said.

What they can't protect, then or ever outside, are their lungs. When Dr. Ronald Shemenski was at the South Pole a number of people working or playing hard outside suffered what he calls "lung burn."

Lung burn is an injury to the trachea, or windpipe, where air is warmed and moistened, Silva said. The extremely cold, dry air parches the trachea, leaving it red and engorged. Sufferers end up coughing up blood and mucous.

"That's what happens to the 300 Club," Shemenski said. "After that it sounded like a TB clinic."

Even teeth succumb to the extreme cold, becoming painfully sensitive when people breath outside, said Servais, the McMurdo. During Winfly Servais made several molded plastic shields to insulate and protect peoples teeth while they work outside.

"I expect I'll hear more about it down at Pole, when I get there next week," he said.

Altitude sickness is a worse problem than frostbite at the South Pole, which has a perceived elevation of 10,400 feet (3,170 meters). Everyone feels the effects, and up to 10 percent end up in medical after getting off the plane, Silva said. The prescribed defense is rest, water and acetazolamide, a drug shown to reduce symptoms of acute mountain sickness. Most people adapt to the elevation in about 10 days, Silva said.

Not every physical change people experience in Antarctica can be blamed on the conditions. Though a Japanese study found people wintering in Antarctica gradually gained weight, they determined the cause was a decrease in physical activity. They neglected to study whether it correlated with a chocolate craving.

Vostok just one of many lakes

By Kristan Hutchison
Sun staff

Antarctica is not as frozen as people thought.

Beneath all that ice are millions of gallons of water. Lake Vostok is the biggest, but it's not the only lake in Antarctica.

Reanalyzing data from flights over the eastern half the continent revealed 77 lakes under the ice, according to research by Martin Siegert, a British glaciologist. Combined, the lakes actually cover more of Antarctica than Lake Vostok, which is 5,405 square miles (14,000 square km.) The lakes clustered beneath Dome C, one of the prime lake regions, make up 5,792 square miles (15,000 square km). More lakes, at least 5,792 square miles (15,000 square km) worth, lie beneath the rest of the ice sheet.

The lakes vary in size and depth, from tens to hundreds of meters deep. In all they may hold from 959 to 2,879 cubic miles (4,000 to 12,000 cubic km) of water.

"There's a lot of water under the ice sheet that people never thought about," said John Priscu, a biologist from Montana State University.

Priscu and other scientists believe it would be wise to test sampling techniques in the smaller subglacial lakes before try-

ing them on Lake Vostok. But first more information is needed on the smaller lakes, including making sure they don't interconnect with other lakes under the ice.

"At this stage we don't know much about the other lakes. We have a lot of data about Vostok," Priscu said. "If we go into another lake we'll have to know the boundary conditions too."

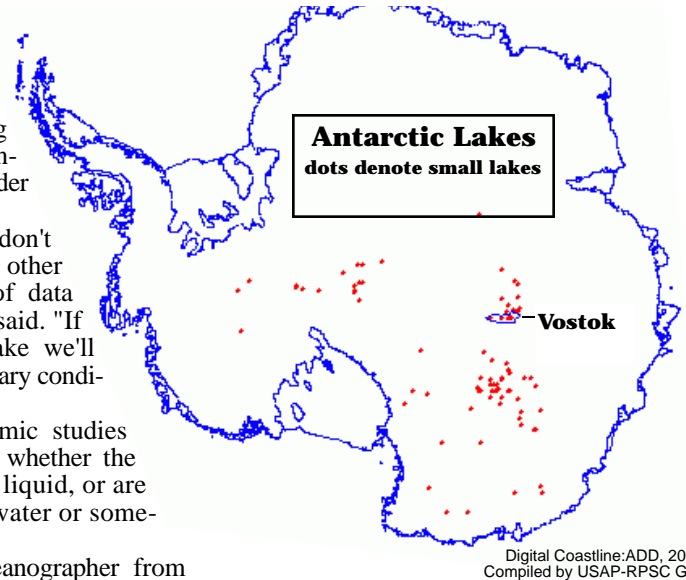
Priscu expects seismic studies will be needed to see whether the smaller lakes are truly liquid, or are pools of mud, frozen water or something else.

David Karl, an oceanographer from the University of Hawaii, also believes the smaller lakes may be good test cases.

"At least we can get some experience, we can get some information," Karl said.

The small lakes seem to be clustered around ice divides, where there is little slope and the ice moves slowly. Many more lakes could still be found.

"West Antarctic hasn't been examined very well in terms of lake surveys," Priscu said.



"There's a lot of water under the ice sheet that people never thought about."

-John Priscu

Vostok From page 1

est in the lake high so they will continue to receive funding. American scientists, including the National Science Foundation, are much more cautious, urging development and testing of cleaner technology before the lake is penetrated.

The NSF has scrapped a timeline sketched out at an NSF workshop in 1998, which would have had access holes drilled into the lake next year and samples removed in 2003.

That schedule has been delayed as much as 10 years, said Julie Palais, glaciology program manager for the Office of Polar Programs.

"Anyone who thinks about this realistically will realize it's going to take a long time to develop the technology," Palais said. "To me it's one of the most challenging projects I've ever been involved in as far as the how-tos."

The NSF is trying to bring together biologists, glaciologists, robotics engineers and other disciplines to develop a way of pulling a sample out without contaminating the water. Palais co-chairs the steering committee on subglacial lake exploration with

Polly Penhale, biology and medicine program manager for the Office of Polar Programs.

"There's always been pressure from some of the other countries to keep up the momentum," Palais said. "So we're trying to do what we can to get people talking to each other and get the right mix of communities."

Last year the NSF supported grants to look through the ice at Lake Vostok with ice-penetrating radar and lasers. This year American scientists are working on Lake Vostok from afar, trying to decide how to approach the lake. At the Lamont-Doherty Earth Observatory, Bell has been using the data gathered last year to create a model of Lake Vostok, mapping out the circulation of water within the lake. The circulation patterns will eventually determine where to sample the lake.

Bell has determined that the lake itself isn't flat. Sealed in by the heavy ice sheet, the surface of the water itself slants and curves, like water would in a Tupperware bowl when the lid is depressed.

The ice over the lake is easing its way downward with the slope of the lake. As it

moves, the ice sheet scrapes dust, algae and other traces of life from the ground, carrying it into the lake. Bell estimates it takes 60,000 to 70,000 years for a single spot on the ice sheet to move from one side of Lake Vostok to the other.

The lake bed is also varied. Islands stick up from the lake, gouging holes in the bottom of the ice sheet as it passes over. Those holes are filled by lake water, which freezes to the ice sheet as it crosses.

"This is where actually the ice sheet is taking up samples and moving it across the lake," Bell said.

When the Russians were drilling the ice core in 1998 they stopped short of the liquid water, but they did bring up a section of what later turned out to be frozen lake water on the bottom of the long ice core. The sample of frozen lake water was so clear "you could read a newspaper through this ice core," Karl said. "This is the best sample we have of the open lake, at least until the point the ice is drilled."

When scientists realized what it was,

Vostok From page 9

15 million years ago

Ice sheet seals off Lake Vostok.

1955-57 *First Soviet Antarctic Expedition hypothesizes that lakes could exist under ice sheets.*

1961 *Russian pilot compares flat areas atop the Antarctic ice sheet to lakes in other settings.*

1963-64 *Russian team collects seismic traces adjacent to Vostok station, which would ultimately lead to recognition of the liquid lake below.*

1973 *Scientists use airborne radar to detect several small subglacial lakes.*

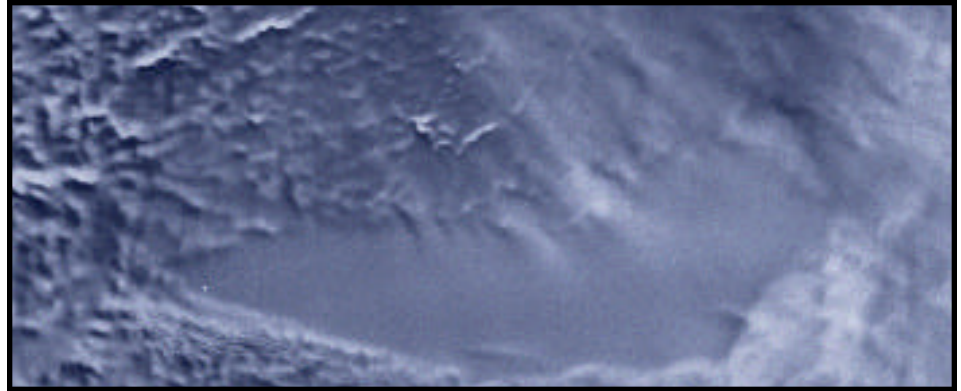
1994 *Russians drill icecore above Lake Vostok. Discovery of Lake Vostok reported and an international conference convened.*

1996 *Scientists speculate that Lake Vostok is a fresh-water lake with a resident population of microbes.*

1998 *Russians drill to within about 400 feet (122 meters) of the liquid water.*

2001 *Airborn survey of Lake Vostok allows scientists to map it below the ice.*

A satellite photograph showing Lake Vostok as a smoother expanse in the otherwise rough ice terrain.



they scrambled for a piece of the accreted ice.

"Suddenly this accreted ice has become like the gold standard. It's gone up in price," said Karl one of the few researchers to get a chunk. He got a half-meter piece. Melted down it would be one liter.

The first thing he had to do was decontaminate it, since the Russians didn't drill the core with sterile equipment. Quite the opposite, they filled the hole with kerosene and freon to keep it from collapsing. Karl melted the outer layers of ice off to reach a purer core, which was then melted.

The big question is what, if anything, is living under all the ice. Whatever is down there would have to overcome subzero temperatures, low levels of organic and inorganic nutrients, and the extreme pressure of the ice and water above.

Karl was willing to bet on bacteria. Scientists estimate about 1 million kinds of bacteria exist, of which they've discovered only 0.4 percent, he said.

"Chances are any bacterium you find will be a new one," Karl said.

The melt-water revealed at least two organisms visible under an electron microscope, one rod-shaped and the other round. Karl managed to revive them, feeding them glucose which they processed into protein.

John Priscu has also been studying ice from Lake Vostok. He received 23 samples from the ice core and has analyzed 11 so far.

"My data's showing that there is a hotspot for biology down near the bottom of the lake, there is a source for bacteria," Priscu said.

Just last week Priscu got pictures of what he believes are the first viruses found in the lake. He also has DNA samples from the ice ready to process.

"We hope in the next few weeks to have DNA fingerprints of what's in the ice all the way down," Priscu said.

The Russians, with the help of the French and the Americans, plan to ship out samples of the last 10 to 11 meters of ice from the very bottom of the Vostok ice core. This week two French scientists and a crew of Russians will come through McMurdo Station on their way to Vostok to select the samples. They could be the most important samples yet, Palais said.

While scientists vie for pieces of the rare ice to study, they continue to struggle with whether or

not to penetrate the ice to sample the water below. If it's not done right, the entire lake could be contaminated and rendered worthless for further study. But if it works, Lake Vostok could reveal secrets about life in previous ice ages, 543 to 750 million years ago, or life on icy planets and moons.

Lake Vostok has also drawn the attention of the Antarctic and Southern Ocean Coalition, a conservation group dedicated to protecting Antarctica. The coalition is supporting guiding principles developed by the Scientific Committee on Antarctic Research for exploring subglacial lakes. The principles require any research to be internationally coordinated, interdisciplinary, and non-contaminating.

An international group of specialists that includes Bell and Priscu, organized under the auspices of SCAR, are meeting this month at the headquarters of the Italian Antarctic Program in Bologna, Italy to discuss technology and contamination issues.

"We've convinced them we're not cowboys, out to drill a hole," Priscu said. "As a scientist you don't want your gravestone to read that this is the person who contaminated one of the last frontiers on the planet."

Answer for crossword from page 2

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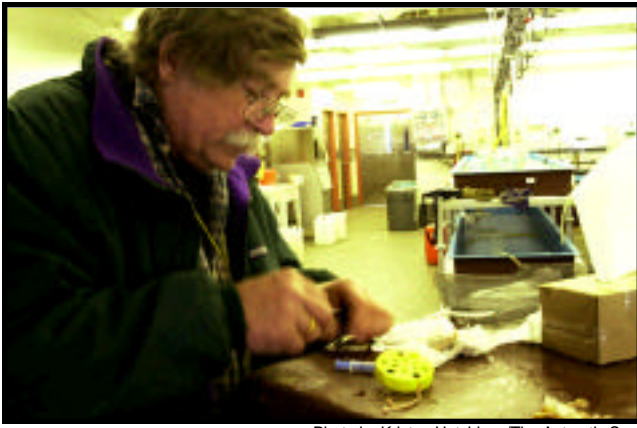


Photo by Kristan Hutchison/The Antarctic Sun

Art DeVries dissects fish parts in the Crary Lab at McMurdo.

Scientist recovers runaway codfish

By Kristan Hutchison
Sun staff

In the world of science, Art DeVries just won the lottery.

His winning number? A001229/A001S, the one on the tag of a fish caught Feb. 28 north of Cape Adare. It's the first of the nearly 5,000 *Dissostichus mawsoni*, or Antarctic cod, DeVries tagged to be recaptured and returned from somewhere beyond McMurdo Sound.

Consider the odds. Antarctic waters are protected from fishing, so few boats are there. Fishing boats that do cross into the Antarctic would be pirate ships, which disregard tags along with fishing regulations.

DeVries' mawsoni was caught by one of three New Zealand fishing boats crossing the Antarctic convergence, the region where cold Antarctic water meets the more temperate waters from the north, as part of an experimental fishery supervised by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR). The CCAMLR observer onboard noticed the tag when the mawsoni was caught in February and made a point of saving it. The information was passed on to Neville Smith, a senior scien-

tist with the New Zealand Ministry of Fisheries. In June, Smith tracked the tag to DeVries.

"This is obviously a very significant recovery," Smith wrote DeVries during their e-mail exchange.

The tagged fish was a 74-pound (33.5 kilogram) female Antarctic cod, which DeVries believes was tagged in 1997. Mawsoni can live to be 40 years old and several hundred pounds, DeVries said.

Since first tagging mawsoni in 1972, DeVries recaptured 13 of his tagged mawsoni, all in McMurdo Sound. This is the first tag returned from elsewhere, caught on a longline east of the Balleny Islands about 500 miles from McMurdo.

"What it does show us is we've got long distance movement," Smith said.

DeVries was not surprised by how far the mawsoni travel. He's recognized before that mawsoni tend to disappear from McMurdo Sound in late December and January.

Though the chances of one being recaptured were slim, DeVries started tagging mawsoni because he figured someday they would be commercially fished.

"It's important so they have some infor-

mation to help regulate the fishery, so they don't overfish it," DeVries said.

Overfishing is already a concern. The mawsoni's sister fish, *Dissostichus eleginoides*, is heavily fished and by some measures threatened. During the 1999 to 2000 season the CCAMLR estimated more than 22,045 tons (20,000 metric tonnes) were harvested and served up as Chilean seabass or Patagonian toothfish. The Japanese currently buy it wholesale for \$3.3 USD to \$4.6 USD per pound.

Sometimes the lines and nets fishing for *eleginoides* end up capturing mawsoni as well, which generally lands on the table, DeVries said.

Currently nobody knows how many mawsoni there are or where they spawn. One theory is that the mawsoni spawn near the Antarctic convergence zone where the cold and warmer waters meet and their eggs float there.

Some of these questions need to be answered before fishing starts in earnest on the mawsoni, DeVries said.

"If they do spawn in some localized area, it's probably important they not fish there," DeVries said. "Otherwise they could destroy some localized crop."

Continental Drift

Who is your Antarctic hero and why?



"My hero of old is Shackleton; his leadership style; for the way he related to his crew and how he handled conflict."

Kristin van Konynenburg,
Palmer Station physician,
from Porta Costa, Calif.



"JP. The dude is thoroughly positive. I've never heard him say anything bad about anybody...I can only hope someday I have his attitude."

Rob Shaw
South Pole Operations, from
Colorado Springs, Colo.



"Shackleton. Because he kicked arse. He did everything."

Tad Hoening
McMurdo general
assistant, from
Richmond, Ill.



Profile Preacher on the run

By Mark Sabbatini
Sun staff

John Harrison takes on Mass and marathons on the Ice

A month isn't a long time to work in Antarctica, but Father John Harrison has a natural talent for moving quickly.

The Catholic priest is making the most of his few weeks at McMurdo Station, whether it's planning Mass on-the-fly due to the unpredictable schedules of those on the Ice or helping someone train for their first marathon. He is also fulfilling his role as a counselor and instructor, hoping to do some racing himself and planning to visit the South Pole before returning home to his duties as parish priest of St. Bernadette's Parish, Forbury, and Chancellor for the Diocese of Dunedin, New Zealand.

"It's the (diocese) furthest from Rome," he said.

Harrison is the second of three "Father Johns" assigned to the Ice this summer - three of the four Catholic priests appointed this season are named John. He was asked to come to the Chapel of the Snows in August by Father Gerard Aynsley when a commitment to a high school kept the latter from coming south.

Another of Harrison's interests - aviation - prompted a colleague to recommend him.

"He said 'Why don't you ask John Harrison? His interest in aircraft must also involve an interest in working in the Antarctic,'" Harrison said.

"As it happened, I had no weddings and I had no school breakups (graduations) during the month of November."

His work has been largely around Dunedin during the 30 years he has been ordained, including stints of several years as high school chaplain, prison ministry and supervising the city's Catholic Social Services family counseling agency. He also studied church law in Canada for two years, which plays a large role in the research and record-keeping duties he performs as chancellor.

Working in Antarctica interested Harrison, but he said only priests from Christchurch were being deployed to the Ice until three years ago. When two priests from his diocese were selected to go to McMurdo, Harrison put in a note to Father John Coleman (the first of this year's "Father Johns") saying he was interested in serving there as well.



Photo by Mark Sabbatini/The Antarctic Sun

Father John Harrison pauses before Mass on Monday evening at Chapel of the Snows.

The regular chapel schedule is plentiful - including a daily Mass, a weekly Bible study and other offerings - but the irregular schedules of those working on the Ice often prevents them from participating, Harrison said. His other roles include visiting the work sites and counseling.

"Counseling covers a whole range of areas from small minor pastoral concerns and questions to relationship areas," he said.

Garrett Hixon, the chapel's administrative coordinator, described Harrison as laid back and enthusiastic. He quickly made an impression on her with his running ability, and he is now offering her tips to improve her performance and possibly take on her first marathon.

"I'm impressed," said Hixon, a Point Clear, Ala., resident who is working her fourth year in Antarctica. "He's focused, he's motivated and I was floored."

Harrison said his interest in running started as a teen-ager.

"I was always light-framed, so I was not a good candidate for rugby ... so I got into distance running," he said.

He said he finished a marathon during the late 1970s in less than 2 hours and 50 minutes on a training plan of only 25 miles a week. Back problems forced him to halt his running until a parishioner put him in touch with a personal trainer, and he ran a half-marathon in 95 minutes shortly before coming to the Ice. He's planning to run today's six-

mile Cape Armitage Ski Race to Scott Base and back.

"I really don't go out and belt myself around as much as I used to," he said.

Becoming a priest also interested Harrison at an early age. He said he wanted to carry on the work of those who had influenced him, but that interest tapered off as he neared the end of school.

"When I left high school I thought I'd get a job that doesn't require any study," he said. "So I took a job at the Bank of New Zealand."

That didn't quite work out as Harrison hoped, since on his first day his supervisor told him he needed more study as part of his job. A year later the urge to join the priesthood was beckoning him again.

The experience at the bank was probably a blessing, Harrison said, since he might not have finished seminary had he joined straight out of school. It also gave him an early taste of work related to Antarctica, as part of his duties included changing money for the crews of US Navy ships stationed halfway between New Zealand and the Ice for Operation Deep Freeze.

The military played a role in Harrison's interest in aviation history and construction, since two of his uncles served in the British Naval Air Service during World War II. He considered learning to fly himself during the 1970s, but said that with the rising price of fuel it would take a month's salary just to get one hour in the air.

"I made a decision I could do more for others with my limited salary," he said.

The oldest of eight children - including a brother who is also a priest - Harrison said he has given little thought to retiring, especially since there are fewer priests these days and their age is increasing.

"It's more like recycling these days," he said.

Harrison is scheduled to leave the Ice on Dec. 5, with a visit to the South Pole planned at the end of November. He said among those he'll be thinking about then are some friends in the U.S. and Canada who need a bit of geographic orientation.

"I said I'll think of them when I'm standing on top of the world," he said.