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The Antarctic Sun

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Billy Texter / Special to *The Antarctic Sun*

Steel arches are installed at the WAIS Divide field camp this summer. They will house the ice coring drill that will arrive at the field camp next year to extract a 3.4-kilometer-long ice core.

Related stories inside:
Radar used to map bedrock, page 8
Ice crystal alignment sheds light on sheet's past, page 9

WAIS ice will help predict global climate

By Emily Stone
Sun staff

Kendrick Taylor knew people were grumbling around McMurdo Station in November when flight after flight was cancelled to the site his team had selected for the new WAIS Divide field camp.

"(We) picked a doozy," he said of the spot on the West Antarctic Ice Sheet that was proving inhospitable to airplanes, but is the perfect place to drill a 3.4-kilometer-deep ice core to look at 100,000 years of global climate history.

The location gets a lot of snow every year — hence the storms that were keeping the planes out. But that means the annual layers of snow will remain at a measurable thickness even after tens of thousands of years.

The spot also sits on the ice sheet's divide, which is like a watershed divide. A snowflake that falls just to the east of the site will slowly travel east in the ice sheet, and the opposite will happen to a snowflake that falls just to the west. Ice divides are the preferred spot to collect a core, because the ice there fell as snow on the divide instead of being transported from somewhere else. Knowing

See CORE on page 7

Historic huts house Antarctic fungi

By Emily Stone
Sun staff

Ernest Shackleton and Robert F. Scott certainly had more important things on their minds when they built their huts on Ross Island than the buildings' long-term structural integrity and aesthetics.

The men did their best to survive the elements, with varied success. Now, about 100 years later, their huts are getting the attention they need with the help of scientists from the University of Minnesota who are studying mold and other environmental factors that are destroying the huts.

Principal Investigator Robert Blanchette and two other Americans have teamed up with researchers from University of Waikato to help New Zealand's Antarctic Heritage Trust assess what is hurting the huts and how to best fight it.

"They need to have information," Blanchette said while pointing out mold and wear at Shackleton's hut at Cape Royds. "That's what we try to provide them."

The scientists were asked to help figure out how to protect the huts, but in the process, they've learned much about the area's ecosystem. They expected to find that the fungus causing the wood to decay had been brought down with the explorers. Instead, they've learned that the major species here are not from temperate climates, but appear to be indigenous to Antarctica.

See FUNGUS on page 10

Emily Stone / *The Antarctic Sun*

Mold grows on a wooden box in Ernest Shackleton's 1907 hut at Cape Royds.

Quote of the Week

"This is the last time."

— Worker, saying an oft-recited but rarely heeded phrase, as he left for his third consecutive winter at the South Pole.

INSIDE

Spend the day with a "UT," the station handymen
Page 3

McMurdo Internet and phone upgrade a success
Page 11

From scientist to janitor and back again
Page 12

Making the grade

Al Baker / Special to *The Antarctic Sun*

Late last month, the South Pole Station Modernization team received word that it had received conditional occupancy for sections A4, B3 and B4 of the new elevated station, along with the emergency fueling module, the vehicle fueling module and the Dark Sector Lab, which houses the new BICEP telescope.

"This is an especially significant accomplishment because the new elevated station is now fully operational (including the new station operations center); we did not anticipate having the B4 wing (the new gym) ready until next summer and the facilities under the dome will now go cold forever and be demolished. To Antarctic history buffs and to many of the rest of us this is a significant and momentous occasion," wrote Louis C. DeMaria, Raytheon Polar Services Co. chief of operations, in an e-mail to employees on Jan. 28.

The new building houses rooms for 154 personnel, a dining hall, science labs, offices, a music room and even a sauna. Total cost of the project is about $140 million. This winter will be the first that the entire population, about 70, is housed in the new station.

Cold, hard facts

A peaceful agreement

Date the Antarctic Treaty went into effect: **June 23, 1961**

Original countries that signed the treaty: **12 — Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, Russia, South Africa, United Kingdom, United States**

Number of countries that have agreed to the treaty: **44,** representing **80 percent** of the world's population

Number of nations with consultative status and which conduct substantial scientific research: **27,** which includes countries on all **six other continents**

Number of separate international agreements negotiated since the treaty went into effect: **5,** including one specifically on the conservation of **seals**

Source: U.S. Antarctic Program, British Antarctic Survey

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Level 1 Comix **Matt Davidson**

Keep on burnin': UTs maintain furnaces, boilers and even that beloved Frosty Boy ice cream machine

By Peter Rejcek
Sun staff

They keep the heat burning, the waffle irons cooking and even the espresso machine at the Coffee House steaming.

They are the folks who work in the preventive maintenance shop, though we know them better simply as UTs, holdover U.S. Navy slang for utilities technicians. The official generic job title is utility mechanic.

But by whatever name you call them, the UTs bustle behind the scenes — perhaps you'll find them crawling into the innards of furnaces or boilers like modern day chimney sweeps. You've probably passed one of the reefer guys, the refrigeration mechanics, in the dining hall resuscitating the Frosty Boy machine, McMurdo Station's lifeline to soft-serve ice cream. They are often called in late at night to battle Big Bertha, the nickname of the dishwashing machine.

Rob Carlson is one of 25 UTs who work in the shop this season. I joined Carlson, a maintenance specialist, on a recent Monday to see how a typical day unfolds.

A day in the life

The workday starts at 7:30 a.m. sharp in the commercial laundry room at Building 155. That's where the entire crew gathers for a brief review on projects and morning stretching exercises. There's also a smattering of banter and good-natured ribbing.

Afterward, Carlson hustles back to the UT shop, in Building 136, to quickly fill out his timecard and grab a few tools. Before heading out on his rounds for the day, he and the UT shop electrician, Joe Willhoit, stop in at the vehicle maintenance facility to check on the delivery of a new hoist they have to install in one of the garage bays. The shiny yellow hoist has already been delivered and staged — a good thing with the impending arrival of the re-supply vessel. It'll be easier to climb Ob Hill backwards than schedule a heavy equipment delivery when off-load operations begin.

Time to get on the road. Carlson borrows a Mattrack vehicle (a four-wheel-drive pickup outfitted with rubber tracks instead of wheels) from the mechanical equipment center. Then he begins the long commute to work.

A few years ago, the UTs started working in zones — swaths of the station and surrounding areas that they're responsible for maintaining. Carlson works in zone four, which includes Williams Field Skiway and Pegasus White Ice Runway, about an hour away in the Mattrack. The helicopter hangar and passenger terminal; the power, water and wastewater plants; and the dive shack are also on the route.

Today he's joined by Willhoit. Willhoit is in charge of several installation projects around the station, and Carlson has been working with him. They want to look at an aging furnace that's squeezed into the bottom floor of the air traffic control tower at Williams Field.

Peter Rejcek / *The Antarctic Sun*

UT Rob Carlson checks for leaks from the new radiant heat system in the MCC building that he helped install this month.

"A lot of our equipment is really, really outdated," Carlson said. Some of the furnaces and air handlers, for instance, go back 30 or 40 years. Parts are not always readily available for some of these ancient pieces of equipment, so keeping them going takes not only skill but also ingenuity.

"You can't run down to Home Depot," Carlson said, "so you end up having to be creative."

The two UTs arrive at the airfield around mid-morning. Sure enough, there's no easy fix for the installation of a new furnace, jammed alongside a skinny staircase. They discuss their options and figure the project will require a configuration change request to re-engineer the heating system. Eventually, Willhoit catches a shuttle back to McMurdo, and Carlson then gets busy on his rounds — a daily check of all the furnaces. There are about 30 of them alone at the airfield.

He pops in and out of just about every building, looking and listening for obvious problems to ensure the oil-burning furnaces are working OK. Experience can tell him right away, for instance, when an unusual clang is indicative of a more serious problem. He pokes his small flashlight into tight, dark spaces, trailing the light over the ducts.

"A lot of what we do is preventative maintenance," explained Carlson. Equipment is checked daily, monthly, quarterly and annually. An annual checkup on a furnace can take a couple of days to complete — as long as the time for the installation of a new one — because the UT must break the whole machine apart.

During the last several years, a more aggressive policy of replacing outdated equipment has cut down on service calls and maintenance, according to Carlson. He estimates that over the last three years about 35 new furnaces have been installed, many in his zone.

"That's made a big difference," he said. "I get to reap the rewards of my own work."

Back in McMurdo for the afternoon, Carlson decides to inspect an installation job he did with Willhoit in the cargo bay of the movement control center building. With the help of various departments, they had replaced the old radiant heat system, a job that took about two weeks to finish.

In the cargo area, Carlson spies a couple of oily spots on the concrete pad. After running back to the shop for a harness, he climbs into the scissor lift and heads about 10 meters into the air to tighten a couple of oil pumps. It's about a 20-minute job.

It's not all about being handy with a wrench. The department has to track and order more than 11,000 different kinds of equipment. And parts ordered this season won't be on the shelves and available for use until the 2007 winter.

"It's funny," Carlson said, "a lot of people don't realize how much equipment there is."

What makes a good UT? Most are people who like to tinker, according to Carlson, the kids who tore apart their remote control cars and put them back to together. "Erector Set kind of kids," he said.

For instance, Carlson's schooling is in physics, but his background includes working as a machinist production manager for a company that assembled everything from missile launchers to artificial limbs. He first came to the Antarctic in 2000 and worked as a UT at the South Pole.

The UT shop foreman, Libor Zicha, said there's no one person who can fix it all, but as a team there's nothing his UTs can't fix. "It's good to have different kinds of expertise," said Zicha, an ex-patriate from the Czech Republic with an electrical-mechanical background. He worked about 10 years in coal mines before immigrating to the United States.

"It's a great bunch of guys," Zicha added of his crew.

Perspectives

Janitors provide sweeping support

By Hilary Oliver
Special to the Sun

We haunt small closets in every building on station. Some of us do our work in deserted buildings late at night. We leave no trace of our presence except perhaps an occasional damp floor or shiny, clean bathroom. All of us are on a mission: to keep McMurdo Station sparkling for the scientists uncovering the mysteries of this continent and the other workers who keep the station humming smoothly. We are the janitors of Antarctica, supporting cutting edge science using mops and disinfectant.

Don't get me wrong — scrubbing grungy floors and showers isn't any more glamorous in Antarctica than other places. But one great perk of the job is being able to work for something much larger than any individual. As a janitor, I have not only had the chance to visit the last frontier on Earth, I've also contributed in a small way to some world-changing science.

When researcher Jennifer Mercer gave a lecture about the 20th anniversary of the discovery of the ozone hole, she gave specific thanks to all the station services staff, like janitors and dining room attendants, who make it possible for scientists to focus on their research while in Antarctica. The thank-you was a reminder that even the least alluring jobs on the station contribute on some level to major discoveries. In the case of the ozone hole, it even led to changes in international law — the Montreal Protocol.

I haven't always worked as a janitor. For a chance to visit the Ice, I left a job as a freelance magazine writer in Colorado. When I told a friend back home that I was taking a janitor job in Antarctica, her jaw dropped with confusion. "Why would you do that? You have a degree!" she said. But I felt the magnetism of this unique environment, and the idea of being a part of such exciting discoveries was enough to make me trade in typing to wield a toilet brush for a season. And I'm glad I did.

When the South Pole traverse team left McMurdo to attempt an overland route to the Pole, I got to personally wish them luck at breakfast the day of their departure. While others around the world have read about the team's historic journey in newspapers, I got to personally connect to an achievement of worldwide importance.

Steven Profaizer / *The Antarctic Sun*

Hilary Oliver works as a janitor in Building 155, the hub of station activity. She feels that supporting the scientific research happening on the continent makes her job well worth the effort.

Through my work at McMurdo, I've chatted with folks studying everything from meteorites to foraminifera. One of my coworkers, cleaning in the Crary Science and Engineering Center, was invited by a scientist to view a special species of starfish that bear their young along on their bodies as they grow.

Science aside, I've also had the chance to see emperor penguins up close, meet people from all over the world, and camp out on a continent few will ever visit.

But even though life in McMurdo is an unusual adventure, even for a janitor, it's not *la vie en rose* every day. Many of the grantees who travel through McMurdo on their way to field camps or the Pole have a difficult time understanding the quirks of life in McMurdo, which sometimes makes more work for janitors and others in similar jobs. For example, in McMurdo, trash must be sorted carefully into different bins for recycling and removal from the continent. Since there are more than 10 different categories, visitors' confusion often results in extra sorting for janitors and waste workers. And most of the janitors know all too well that snow, plus volcanic dirt, plus snow boots trekking inside for meals, equals an incessant battle against muddy floors in the station's main building.

But just when it feels like the eternal scrubbing, sweeping and mopping might all be in vain, a small gesture of appreciation can make it all worthwhile. As I swilled out a bucket of mop water recently, two grantees met me with smiles and profuse thanks. They had just come back from the field studying the geology around the Ross Sea and were thankful to have a clean dorm to call home. They were so appreciative of my cleaning their bathroom, they even offered me a bottle of wine as a thank you.

But with or without recognition, Antarctic janitors will continue their quiet battle against dirt and grime to sustain scientific research on this crazy, white, mysterious continent.

Hilary Oliver is a janitor at McMurdo Station. This is her first season in Antarctica.

around the continent

PALMER

Sunny days for Palmer

By Kerry Kells
Palmer correspondent

Both yachts, the *Sedna IV* and the *Onora*, departed last week. The *Sedna IV* crew finished its filming and sent an e-mail back reporting sunny weather. The yacht *Onora* with owners/captains Jim and Jean Foley left to go back north to the South Shetland Islands. The yacht *Vaihere*, a 24-meter, two-masted charter yacht, stopped by station and tours were given to nine passengers from Germany, France and Belgium. We also received a visit by the Argentinean naval vessel, the *Castillo,* and eight officers came ashore for tours and lunch.

The Palmer art show was held this week, hosted in the bar/lounge. The show included a quilt and one in progress, knitted hats and scarves, a rug in progress, block prints, watercolor paintings, photographs, pastel drawings and sculptures all created on station. A slide show of photographs from Palmer, elsewhere in Antarctica and around the world taken by different members of the community played. Several people also performed, with music, singing, poetry and prose recitals.

In the world of science, Ronald Kiene, co-principal investigator of the biocomplexity group from the department of marine sciences at the University of South Alabama, Mobile, gave the science lecture. He talked about the cycling of DMS (dimethylsulfide) and its precursor DMSP (dimethylsulfoniopropionate) in the ocean.

Kiene introduced DMSP, which is produced in large amounts by marine algae and phytoplankton. Some phytoplankton, when under stress, cleave DMSP into DMS. He mentioned that DMS is produced in nearly all natural environments, from soils to lakes to oceans, and even in human beings.

Kerry Kells / Special to *The Antarctic Sun*

An Adélie penguin prepares to feed its chick on Torgersen Island. The chicks are growing fast and already starting to molt.

DMS then undergoes an exchange from the ocean to the atmosphere, producing sulfur emissions that naturally acidify the atmosphere and affect the amount of sunlight reaching Earth. The DMS group, with Principal Investigator Patricia Matrai, has a study site in the Sargasso Sea as well as in the Palmer Peninsula. In both study biomes (major ecological community types), DMS oxidation products in the atmosphere are studied for their effects on the global heat balance.

Marianne Kaput, a field team member of the entomology group (the insect researchers) and a sixth-grade math and science teacher at Troy Intermediate School in Avon Lake, Ohio, shared her experience with about 10 schools in the Midwest via video teleconference. The teleconference reached more than 400 children.

The students asked Kaput about science and life at Palmer Station. The questions included the possibility of cryogenically freezing a person, the effects of melting glaciers on the environment, and if she could hug or pet a penguin. She even gave a demonstration on how to layer clothing with her extreme cold weather gear.

Many groups went boating and visited the local islands on a beautiful and sunny Sunday. Some went to the old Palmer Station, about a five minute boat ride away, which gives an opportunity for hiking and scenic viewing. Many skua ponds dot a lower area in front of a small glacier. A quick trip to Torgersen Island showed how rapidly the Adélie penguin chicks have grown. Many are as large as their parents and are beginning to lose their brown downy feathers. And the giant petrel chicks are now about a month old.

SOUTH POLE

Garage helps Pole roll

By Mike Mulvihill
South Pole correspondent

After 15 weeks of fast-paced projects, a crowded dining hall, and no empty beds, South Pole's population is on a decline. We closed the week with 241 folks as the first waves of summer workers headed north. Fuel and cargo are still heading south. More than 2.6 million liters of fuel and about 1.4 million kilograms of cargo have been delivered by LC-130s as of the end of January. Despite the reduced population and forthcoming hibernation, there's still plenty to do before the transition to winter.

One of the departments that keeps the ball rolling often goes unnoticed. You may see bulldozers or forked loaders disappear through the large double doors that mask the front into a building under the arch farthest from the elevated station. Inside is the vehicle maintenance facility, more affectionately known as the "heavy shop."

This modern facility is the nerve center

See CONTINENT on page 6

the week in weather

McMurdo Station
High: 37F / 3C
Low: 17F / -9C
Max. sustained wind: 31mph / 50kph
Windchill: -17F / -27C

Palmer Station
High: 45F / 7C
Low: 30F / -1C
Max. sustained wind: 14mph / 22kph
Precipitation: 0mm

South Pole Station
High: -20F / -29C
Low: -36F / -38C
Peak wind: 18mph / 29kph
Max. physio-altitude: 3,158m

Continent From page 5

Jennifer Teague / Special to *The Antarctic Sun*

From left, Mike Mulvihill, Guy Thomerson, Doug Schwieder, Dennis Calhoun and Scott Iremonger work in the South Pole heavy shop.

for anything involving motorized equipment on the station — a very busy place indeed. The new garage, as it is also known by some, is a welcome replacement for its outgrown predecessor next door. Completed in 1999, the heavy shop is big enough to house and repair even the largest equipment on station. It is outfitted with an on-site parts room upstairs, vehicle exhaust ventilation fans, floor drains to catch the melting snow and ice from dripping equipment, and a wide assortment of tools.

It's not unusual to come into the shop and see three or four pieces of equipment being repaired or serviced. But then come back a little later and those machines have disappeared and been replaced by something else. Even the largest repairs happen with surprising speed, and barring any unforeseen circumstances, they can usually be completed in a matter of a couple of shifts.

With six bulldozers, 10 forked loaders, two Challengers, three cranes, two vans, two trucks, a snow haul trailer, 26 snowmobiles and a wide assortment of welders, generators, drills, heater units and compressors, it is easy to see why the doors on the heavy shop are opened and closed often. Each piece of heavy equipment receives its scheduled 250-hour preventive maintenance inspection like clockwork and is thoroughly checked over for safe and efficient operation.

At 1,000- and 2,000-hour intervals, the machinery is inspected, drained, filled, adjusted and tested even further. With the harsh conditions at Pole, the equipment has a very tough life, and it's vital to station operations that they stay running safely and efficiently all season. Extreme temperatures shorten the lifespan of crucial parts such as hydraulic hoses, electrical components, bearings and belts.

Many times when a failure of one of these parts occurs, the piece of equipment is in the middle of an important task and often has to be repaired right where it sits. Whether it's a hose on the crane in the middle of a pick or the starter on a bulldozer with dash lights blinking and a blade full of snow, the mechanics will make a "house call" and get the machine back in service as quickly as possible.

Mechanics work in three shifts and are literally up to their elbows in work every day of the week. It takes a skilled craftsman to understand, diagnose and repair the diverse fleet of vehicles here at Pole. Mechanics must have at least five years field experience (all of them here have at least triple that), and a technical school background is a big plus. The five mechanics who have worked at Pole this season have a lifetime of experience and knowledge that has helped make the 2005-2006 season a successful one.

So, whether you happen to see one in greasy Carhartts in the chow line or walk by a pair of dirty boots sticking out from under a loader, realize that these folks love what they do — and keeping the tracks rolling is just a way of life.

SHIPS

LMG

Compiled from reports by Andrew Nunn
Marine Projects coordinator

The *Laurence M. Gould* continued its research cruise for the Palmer Longer Term Ecological Research project this past week, hitting a number of sampling stations along the planned grid.

On Jan. 25, we dropped off the field camp on Avian Island. The two birders went ashore in a Zodiac, and we followed in a second full of gear for their camp. The hut the team stays at has suffered some damage, and there is a large hole in the roof, which they intend to temporarily repair with a tarp.

On Jan. 28, we ran into a dense pack of brash and berg ice. The decision was made to transit north through our intended route to ensure it would be open to us when we depart from Marguerite Bay. We then returned south overnight en route to Rothera, the British Antarctic research station.

At Rothera, we exchanged 16 passengers with scientists from the station and proceeded out to do three joint conductivity, temperature and depth casts in Marguerite Bay. We moored the vessel for the night at the station, where the crew was invited ashore for a party. We were entertained with two separate bands, including the headliners Tepid Stan.

NBP

From staff reports

The *Nathaniel B. Palmer* arrived at McMurdo Station on Jan. 30 to offload passengers. The ship also picked up several scientists for the final science cruise of the Interannual Variability in the Ross Sea project, a five-year study to learn more about year-to-year changes in the biology, physics and chemistry of the Ross Sea.

Continental Drift

Where would you most like to go on the continent?

"I would like to go to the South Pole ... arrival 2 p.m. on Friday, December 14, 1911, just one hour before Amundsen."

Marianne Kaput, Palmer researcher from West Lake, Ohio, first season

"I must say that I would have to try my best to climb Mount Erebus. It doesn't look like it is 12,000 feet up there. I need proof."

Peter Gates, South Pole electrician from Fairbanks, Alaska, first season

"I'd like to go to Palmer. They've got less people, more wildlife and Bess Kauffman."

Becky Hooper, McMurdo IT/ops admin from West Hartford, Vt., second season

Core will provide planet's best CO_2 record

Continued from page 1

that all the ice in a core fell in one spot makes it easier to interpret.

The group also wanted a spot that had flat bedrock and thick ice, which would produce a climate record stretching far back in time. They found all this in a one-kilometer-wide site 1,600 kilometers from McMurdo.

"That kilometer is very different from the kilometer next to it," Taylor said.

The spot should yield the world's best ice core for examining the relationship between carbon dioxide and climate change.

"We think this is the best site anywhere on the planet to get that CO_2 record," he said.

Taylor, of the Desert Research Institute in Reno, Nev., is the chief scientist on the roughly $10 million WAIS Divide ice core project. Eventually, the project will incorporate more than 12 individual science groups working on their own specialized analysis of the ice core. Together, the information will help paint a picture of Earth's climate over the past 100,000 years. That picture, in turn, will help scientists predict the future climate.

This was the first of five field seasons scheduled for the project. The priorities this summer were to build the infrastructure to support the planned 60-person field camp, and to build the arched steel structure that will house the coring drill. This was accomplished once the weather cleared and the planes started flying. A new drill built by Ice Coring and Drill Services at the University of Wisconsin will be tested in Greenland later this year and installed at the WAIS camp next summer. The last three field seasons will be devoted to getting the full core.

The core

The core is valuable not only because it will hold the best carbon dioxide record from anywhere on the planet, but it will also provide the best Antarctic comparison to a comparable ice core from Greenland. This will help scientists understand climate change patterns across the globe.

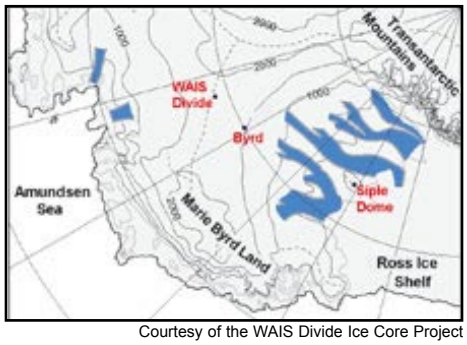
Researchers will be able to tell one year from another for the first 40,000 years of the core, Taylor said. After that, the layers will get more difficult to tell apart, but they will still retain a relatively high resolution, meaning scientists will be able to tell what time period the layers are from with a fairly high degree of accuracy compared to other cores.

Accurate dates are important in looking at the correlation between increased carbon dioxide and climate change. Cores from East Antarctica indicate that changes in carbon dioxide levels cause changes in temperature, Taylor said. But scientists need an ice core with higher resolution to understand this connection more fully, which will allow them to make models of what current increases in carbon dioxide will do to the global climate.

A core of equal depth and resolution in Greenland won't yield the same data on carbon dioxide because chemical reactions with high concentrations of dust in the area would distort these measurements.

But the Greenland core will allow scientists to conduct the first detailed comparison of the timing of climate change between Greenland and Antarctica. The high resolution of both cores will show scientists if climate changes started at one pole and spread to the other over a decade or two. Or, if the changes in temperature are registered in the cores at the same time, then it would follow that the climate change originated closer to the equator and spread north and south at the same rate, Taylor said.

Brandon Burmeister / Special to *The Antarctic Sun*



Courtesy of the WAIS Divide Ice Core Project

Above, the recently installed buildings at the WAIS Divide field camp are quickly overwhelmed by snow drifts. The large amount of snow that accumulates there makes it an excellent place to drill for an ice core. But frequent snow storms make it a difficult spot to reach by plane. Despite some difficulty early in the season, all 49 scheduled flights were completed. The last flight out for the summer was Feb. 3.

Left, this map shows the camp's location on the West Antarctic Ice Sheet, about 1,600 kilometers from McMurdo Station.

Analysis

More than a dozen different science groups will conduct their own analysis of the ice core to plumb this information.

For example, dust trapped in the core can tell scientists about what direction the winds were coming from. Isotope ratios can tell what the temperature used to be at the drill site. They can also indicate an abrupt climate change versus a more gradual one.

Measuring the amount of methane in the core helps to determine the amount of wetlands there were on Earth at a given time. Taylor's part of the analysis will look at the electrical properties in the core, which helps to identify the annual layers in the core that are counted to determine its age.

Researchers will also measure the temperature within the ice coring hole, known as the borehole, to determine what the surface temperatures were in the past. Taylor compares the process to cooking a turkey too quickly and finding it still frozen on the inside. Frozen insides mean that the whole

See ICE on page 9

Radar provides picture of area's bedrock

By Emily Stone
Sun staff

There's no mystery about what the top of the West Antarctic Ice Sheet looks like. It resembles an enormous flat, white ocean. But little is known about what it's like on the bottom.

Prasad Gogineni and his team from the University of Kansas set out to get a picture of the bottom of the ice sheet and the bedrock upon which it sits. They used powerful radar to peer more than 3,000 meters below the ice surface in a 240-square-kilometer area around the ice coring site.

"There's an interesting story that the radar returns are telling us," said team member Claude Laird.

The group believes that the radar is bouncing off water in some areas. They won't know for sure until they've analyzed the data more fully, but they got similar results while testing the equipment in Greenland that later proved to be water.

"It surprised us very much," said team member David Braaten. He said the ice is probably being melted by geothermal activity under parts of the ice sheet.

There are several implications of the discovery if it bears out.

Much of the ice sheet sits on land that is below sea level, making the ice sheet unstable. If it's sitting on a layer of water, that water would lubricate the ice sheet, making it even less stable, and thus more susceptible to global warming, Laird said.

A layer of water also influences the age of the ice at the bottom of the sheet, Braaten said. Melting ice means that the bottom layer of ice is younger than if there was no melting.

"The ice is moving," Braaten said. "As it moves over the hot spot, we're losing ice mass. The deeper layers are essentially gone."

The radar also showed that the bedrock appears to be varied, with some flat areas and some with uneven terrain, said Pannirselvam Kanagaratnam.

The radar is pulled along behind a tracked PistenBully. The group covered an area that was 30 kilometers long and eight kilometers wide. They made passes in the PistenBully every kilometer inside that area and in an even tighter grid in the area immediately around the coring site.

In addition to the radar that looked at the bedrock, two other radars examined the higher snow levels to measure accumulation rates. One radar peered 150 meters down, and the other, which had a very high resolution of three centimeters, focused on the top 10 meters of snow.

Knowing how fast snow accumulates at the site is important because scientists want to know if the ice sheet is in "mass balance," meaning whether the amount of ice leaving the ice sheet as icebergs and meltwater is equal to what is being accumulated as snow.

One of the key questions, Braaten said, is "can we see any effect of global warming?"

Gogineni said the season was "extremely successful."

"We mapped layers that nobody else has been able to map," he said. He plans to have the data analyzed by the end of the year.

Those results will tie in with the information gathered from the ice coring project. The core will help verify the conclusions that the University of Kansas group makes, Kanagaratnam said. Using the information from the core and the radar in tandem means scientists can reach conclusions about what the ice and bedrock is like in a large swath around the core.

"We can connect the dots," Kanagaratnam said.

NSF-funded research in this story: Prasad Gogineni, University of Kansas, www.ku-prism.org.

Brandon Burmeister / Special to *The Antarctic Sun*

Photos courtesy of Pannirselvam Kanagaratnam / Special to *The Antarctic Sun*

Above, the top of the West Antarctic Ice Sheet is a large, flat expanse, but researchers from the University of Kansas want to know what the bottom of it looks like.

Center, the scientists built a radar system to map the area's bedrock, which they pull behind a PistenBully.

Bottom, Pannirselvam Kanagaratnam looks at data from the group's equipment in the back of the PistenBully. The data will complement the ice coring project planned for the WAIS Divide camp.

"Virtual core" shows ice crystal alignment

By Emily Stone
Sun staff

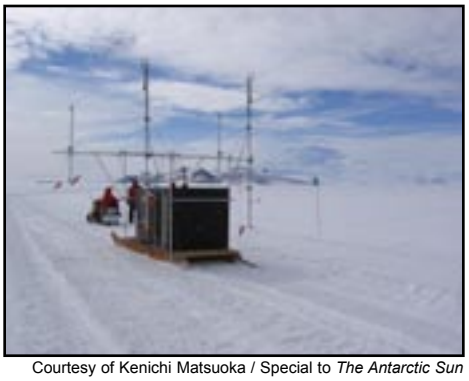
The 3.4-kilometer ice core from the West Antarctic Ice Sheet may supply the most detailed look yet at 100,000 years of glacial and climate history, but it's producing a record that's only about a dozen centimeters wide. Principal Investigators Kenichi Matsuoka and Charles Raymond of the University of Washington want to expand that information over hundreds of kilometers.

Matsuoka was in West Antarctica this summer, leading a five-person team that made a snowmobile traverse around the ice coring site. The team dragged a sled that uses ground-penetrating radar to map the alignment of the ice crystals deep inside the ice sheet.

"The idea is to use a virtual ice core to peer into the ice," Matsuoka said. They started and finished at the WAIS Divide field camp, where the ice core will be drilled, and made a loop that's 350 kilometers long and 100 kilometers wide. They stopped every 30 kilometers or so to take a measurement.

The alignment of the crystals is important for two reasons — it can help the scientists reconstruct the ice sheet's past and give them insight into its future movement. The West Antarctic Ice Sheet is much more dynamic than its eastern counterpart on the other side of the Transantarctic Mountains, and it has the potential to play a major role in rising global sea levels.

Ice crystals start out aligned randomly after a snow fall. As more and more snow falls, the lower layers of snow get compressed and turn into ice. Those compressed crystals tend to align themselves vertically along their main axis.



Courtesy of Kenichi Matsuoka / Special to *The Antarctic Sun*

The University of Washington science group tests their sled-drawn radar on the McMurdo Sound sea ice in November. They then took the equipment to the WAIS Divide field camp.

Kenichi and his crew pulled their sled, dubbed Frankensled, along the ice sheet looking at these crystals. Anywhere they find ones that aren't aligned vertically, they know another force has been at work.

"As the ice sheet flows, it tends to change the orientation of the crystals," Raymond said. As the ice sheet flows downhill, the crystals gradually align themselves horizontally with the direction of flow.

The radar helps to reconstruct the surface topography and ice flow directions of the past, Matsuoka said.

The crystal alignment also affects the viscosity of the ice and can be used to predict how fast it will flow in the future.

Matsuoka used the radar to do a similar study in 1998-2000 in East Antarctica through the Japanese Antarctic Program. No one has done this sort of work in West Antarctica, Raymond said.

Matsuoka will go to WAIS Divide again next year, using another type of radar over the same loop to see crystals at a different depth. The group chose the site so they could share information with the coring project there.

The traverse team will be able to verify their results from the ice core, which will yield a much more precise record. The ice coring group, in turn, can use Matsuoka and Raymond's data to help them expand their knowledge of the ice sheet.

Kendrick Taylor, the chief scientist on the drilling project, said the ice core group wants to know how the ice crystals are aligned not just inside the core, but in a 50-kilometer area around the coring site to see how the alignment correlates to the record within the core.

Taylor, of the Desert Research Institute in Reno, Nev., explained in an e-mail why the radar project is important.

"[The] work is one of the many pieces we will use to translate the measurements on the core to a useful understanding of how the land, oceans, atmosphere and ice interact to create global climate," he wrote.

NSF-funded research in this story: Charles Raymond and Kenichi Matsuoka, University of Washington.

Ice core data enhanced by other WAIS projects

Continued from page 7

turkey was cold not that long ago. The same can be said for the insides of the ice sheet.

"The bottom parts of the ice sheet are just starting to realize it's been warm up there the last 10,000 years," Taylor said.

The ice core analysis will be complemented by two other science projects this summer. Researchers from the University of Kansas used radar to map the bottom of the ice sheet and the bedrock it sits on. Another group from the University of Washington is studying the alignment of the ice crystals inside the ice sheet.

Both groups surveyed an area around the coring site. Their studies will help interpret the information from the core so that "more science can be squeezed out of the ice," Taylor said. By comparing their data with the data from the core itself, scientists can extrapolate their conclusions to a large section of the ice sheet.

"The whole climate history is a big puzzle," said Claude Laird, a member of the University of Kansas team. "It takes all our resources, all the different projects working together, to piece together the big picture."

NSF-funded research in this story: Kendrick Taylor, Desert Research Institute, www.waisdivide.unh.edu.

Brandon Burmeister / Special to *The Antarctic Sun*

Construction crews set up the steel arches that will house the ice coring drill at the WAIS Divide field camp.

Fungus reveals much about ecosystem

Continued from page 1

So far, they've identified three new species of mold in the huts. They've also learned that the previously unknown fungus is the major decomposer of organisms in the ecosystem there.

One curious part of the discovery is that there hasn't been wood in Antarctica for hundreds of thousands of years, yet the native fungi is able to feed off the huts.

"Are these the same organisms that were decaying the wood then?" said Joel Jurgens, a research scientist in the plant pathology department.

The group wants to look at fossilized forests from when Antarctica had a more temperate climate to see if the pattern of decay there is similar to the huts. The fungus in the huts decays the wood from inside the cell wall, an unusual method used by other molds living in extreme environments.

Blanchette said the fungus may be reactivating ancient enzymes that can break down wood. In the meantime, the fungus is feeding off other sources of carbon, like penguin feathers, lichen or moss.

The group is working at Cape Royds and at Scott's 1911 hut at Cape Evans and 1901 hut at Hut Point, next to McMurdo Station. They also hoped to get to Carsten Borchgrevink's 1898 hut at Cape Adare this season, but bad weather prevented them from reaching it.

They've determined that an increase in relative humidity causes a spike in mold growth. Sensors in the huts record the humidity every hour. The group cross referenced that data with visitor log books from the huts and determined that influxes of tourists are not causing the humidity to rise much. The group did recommend that boot brushes be installed at the hut entrances so visitors don't track in snow.

The bigger problem, they've learned, is ice under and next to the huts. When the ice gets hit by the sun it releases moisture into the huts that activates the mold.

This discovery has lead to a major undertaking at Cape Royds to clear all of the ice out from under the hut for the first time. A team from New Zealand's Antarctic Heritage Trust is working on the building this year, primarily restoring the roof, but also chipping away at the 99-year-old ice buildup.

Not only does the group hope this will reduce mold, but the endeavor has yielded some new archeological finds. A couple crates of what looks like whiskey, an axe handle, a bottle of tablets, some tins and part of a sock were found under the hut.

Blanchette also believes he'll find some new goodies from the ice that's being carted away. Tiny chips of timber from old food crates and other wooden materials are mixed into the ice, many of which Blanchette will take home with him to look for microbes. Previously, he's only been able to take miniscule samples of wood so as not to harm the huts.

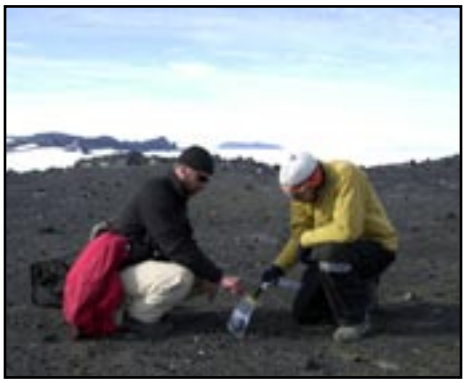
"I think it will be a bonanza of interesting fungi," he said.

The black fungus at Cape Royds can be seen in isolated patches, creeping up the hut walls and across the sides of boxes. It starts where the wood touches the ground and then moves on from there. But this is mild compared to the hut at Cape Evans, Blanchette said.

"It's remarkable how much there is there — just huge blooms," he said of what's living on the wood, textiles and paper in the hut.

Cape Royds was put on the World Monuments Watch List of the 100 most endangered sites worldwide in 2004, so it has been the focus of much restorative attention. Blanchette said he hopes that the Cape Evans hut goes on the list, too, so it can receive the same care.

Photos by Emily Stone / *The Antarctic Sun*



Above, construction workers with New Zealand's Antarctic Heritage Trust put a new roof on the hut at Cape Royds as part of a major restoration project there. A group of American and New Zealand scientists are helping the restoration work by studying the fungi that are decaying the wood here and in the huts at Cape Evans and Hut Point. An Adélie penguin colony sits on the rocky hill behind the hut.

Left, Joel Jurgens, left, and Brett Arenz take soil samples near the hut. They will test the soil for fungus and other microbes when they get back to the University of Minnesota.

Another problem at Cape Evans and Cape Royds is the wind and salt that whip across the hut walls, essentially sandblasting them. In a temperate climate, rain would periodically wash the salt off the wood, reducing the chemical corrosion.

The group is investigating a coating that could be used to protect the huts while still maintaining their historic integrity. They've set up racks of wood blocks that have been treated with different types of silicon and oil coatings. One rack sits near each of the huts on Ross Island. So far they haven't found an ideal coating that can protect the walls at all the locations, Jurgens said, because the weather is just too harsh.

A second experiment near the racks will help establish the diversity and amount of fungi there are in the soil near the huts. In 2002, graduate student Brett Arenz buried pieces of wood and cotton that were soaked in either water or nutrients to act as bait for the soil microbes. He's taken 48 of these samples home from each of the sites this year to test for organisms.

See FUNGI on page 11

Upgrade brings joy to McMurdo Internet users

By Emily Stone
Sun staff

McMurdo Station residents might not be able to tell you the exact moment that it happened, but there's no doubt that anyone here this summer will remember the magical event — the day the Internet sped up.

The station's Internet and phone bandwidth has doubled thanks to an upgrade that's been phased in this summer. The Internet capacity leapt into the 21st century on Dec. 29, and the phones joined in on Jan. 31. The change is making life much more pleasant for anyone surfing the Web or making phone calls, and it will help scientists who need extra bandwidth to transmit data.

The station has gone from 1.5 megabits of bandwidth to three megabits. Megabits are a rate of speed, meaning that 1.5 megabits of information can be transferred per second. Megabytes — what most of us are used to talking about in terms of photo or MP3 files — is a different measurement that refers to file size.

The Internet had been allotted 921 kilobits of the original bandwidth, which can be thought of as the pipe that takes information off the continent.

"Our entire station was going through a pipe that is just a tiny bit larger than your home [bandwidth]" explained Joe Harrigan, McMurdo's network engineer.

Technicians would have to monitor the network almost hourly, Harrigan said, watching for large downloads that were clogging up the system and bringing the Internet to a standstill. With three megabits of space in the pipe, Harrigan said he doesn't anticipate that it will get clogged as quickly.

The other advantage of the upgrade, beyond the extra bandwidth, is the way the phones are integrated into the system. Previously, a certain percent of the pipe was reserved for phones.

"If someone wasn't on a phone, that bandwidth just sat there," Harrigan said. With the new system, any unused phone bandwidth will be available for Internet use.

The number of phone lines has also increased, from 24 to 32.

McMurdo residents' joy over the increased bandwidth probably didn't stop them from grumbling over all the scheduled outages this season. Those outages were necessary to establish the new system, Harrigan said.

"We can't just take the 1.5 megabits and crank the dial up to three and say, 'here we go,'" he said.

Nor did anyone want the station to be incommunicado while the switch was being made. Information from McMurdo is beamed up to a satellite and then down to the United States through a circuit.

Courtesy of Cleve Cleavelin / Special to *The Antarctic Sun*

Riggers Alec Chin and Jay Cairns work on a wind turbine at Black Island. The communications equipment there includes the recently upgraded Internet and phone connectivity, and is powered in large part by solar energy and wind.

Engineers built a second circuit to transmit that information using the increased bandwidth. Both circuits are currently running simultaneously, but the original one will be turned off Feb. 15 and all traffic will be on the new circuit, Harrigan said.

The new pipe averaged about 66 percent capacity when it had just the Internet running through it, Harrigan said. He expected that once the phones, faxes, ATMs and a few other devices all switch over, that number would jump up to 90 percent. But Harrigan said this won't slow things down for users. The pipe doesn't care if 10 percent or 98 percent of the capacity is being used, as long as it doesn't reach the full 100 percent as it used to.

The benefit to the science community has already been felt, said Bec Batchelor, a research associate who looks after year-round experiments for scientists while they're off station. Many of those projects deal with real-time data, which often got bogged down in the system before the upgrade.

"Having the upgrade means data is able to go through much more reliably and in a shorter time," she said.

Fungi study helps hut restoration

Continued from page 10

Seeing a biodiversity study buried in the rough volcanic rock that makes up the ground of Ross Island may seem unusual to McMurdo Station residents. Most microbiology studies in the area are conducted in the McMurdo Dry Valleys across the sound, where the soils provide a home to a relatively diverse microbial world.

"Some of these other ice-free areas have been neglected," Arenz said.

The scientists' research may be uncovering new information about life in Antarctica, but it is geared toward helping the restoration work. The information about mold and other destructive processes is helpful, said Gordon Macdonald, lead carpenter on the Cape Royds conservation project.

"It's really important that we understand the mechanisms of decay so we can treat it," he said.

NSF-funded research in this story: Robert Blanchette, University of Minnesota, forestpathology.coafes.umn.edu/antarctica.htm.

Emily Stone / *The Antarctic Sun*

Robert Blanchette labels bits of wood that he collected from ice chipped away from under Shackleton's hut at Cape Royds. He'll test the wood for different kinds of fungi.

Profile Seeing both sides of station

By Emily Stone
Sun staff

Jane Turner's story about how she got her job at McMurdo Station three years ago probably rings true to many Antarctic workers. She spent her spring desperately calling supervisors about any possible openings so she could simply be in Antarctica. She eventually got a position as a night-shift janitor.

What's unusual about Turner's story is that she'd already been to McMurdo the previous year — as part of a science group. While it's not unheard of for grantees to become support staff, they usually move into a position that involves scientific know-how. Turner, instead, went from crunching geology data in the Crary Science and Engineering Center to cleaning the toilets there.

"I had way too much fun, and I wanted to come back," Turner said.

She came back the summer after being a janitor and again this year as a science technician with her original group, the TransAntarctic Mountains Deformation Project, or TAMDEF, which uses Global Positioning System (GPS) equipment to study how the mountains are moving.

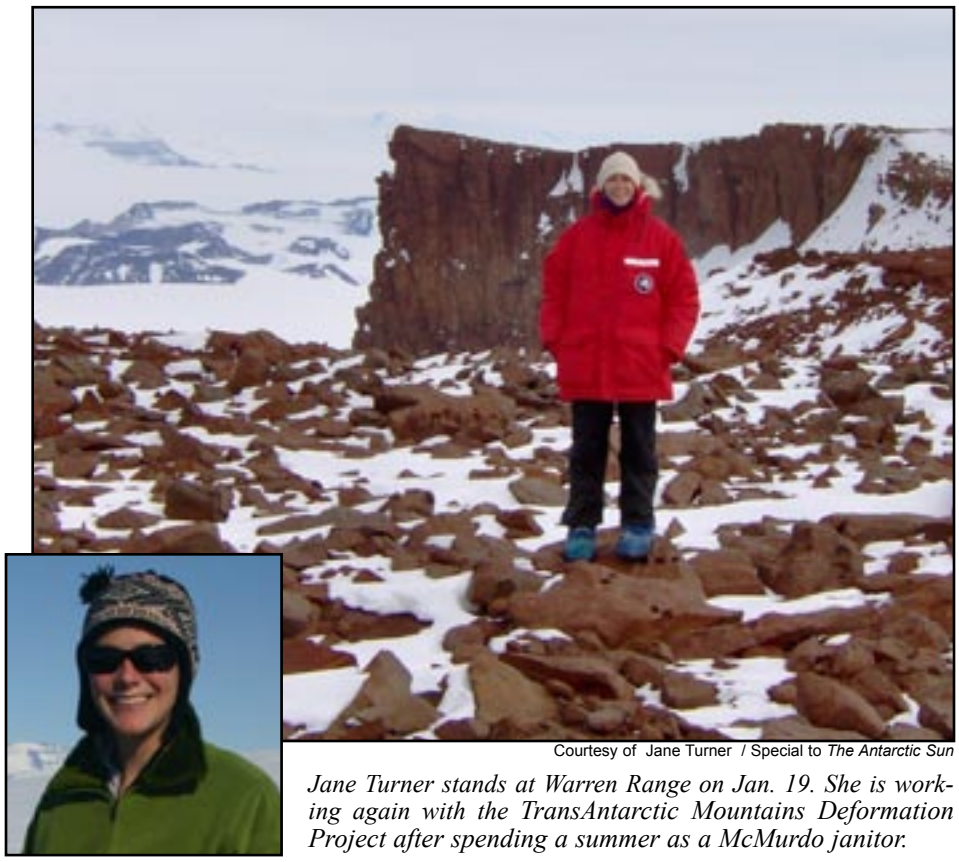
Turner's experience has given her an unusual vantage point on McMurdo society, where grantees and support staff generally live fairly separate lives. She's seen the wonderful perks of being a scientist, with the trips the job provides to beautiful, remote parts of the continent. Yet she misses the close friendships forged by support staff, who are here together for months, and generally work the same shifts with time off together.

"I'm a little envious of the bonds that I see," she said of the support staff community. The long hours that the different science groups work in their own labs and their shorter stints on station mean they become extremely close to their immediate coworkers, but don't often get to spend much time with people outside of their project, she said.

As a grantee who has seen life on the other side, she's sensitive to the fact that most support staff don't get to travel off station much. Rachel Murray, who was the assistant housing coordinator when Turner worked as a janitor, said Turner never talked about her trips as a grantee with the other janitors.

"Unless they asked her, and she'd still be really shy about talking about it," said Murray, who is now the station's recreation supervisor.

Those strong community bonds among the support staff are what brought Turner, now 28, back after her first season here. She had spent about six weeks at McMurdo and like many, she became hooked on the place and the community. She'd left the Mormon Church a couple years earlier and was looking for new experiences.



Courtesy of Jane Turner / Special to *The Antarctic Sun*

Jane Turner stands at Warren Range on Jan. 19. She is working again with the TransAntarctic Mountains Deformation Project after spending a summer as a McMurdo janitor.

The existence at McMurdo of so many single, interesting people over the age of 21 was a revelation in itself, said Turner, who was married at 19 and then divorced three years later.

"It was an eye-opening experience," she said.

The janitor job was the only way she could find to come back. And it worked out great, she said.

She loved the quiet, meditative ambiance of the night shift. She would put on her headphones and listen to 10 albums a night while doing her self-styled "mopping dance," a series of back-and-forth lunges that provided an excellent thigh-sculpting workout.

Turner got her initial job at McMurdo while working for the U.S. Geological Society in Utah, where she told her boss, "I want to go somewhere crazy."

Since then, Turner has sought out many unusual experiences. She works at a fire lookout in Idaho in the summers, spending three months in a cabin by herself with no electricity or running water, 80 kilometers from the nearest town.

"There are 50- to 80-mile views and there's nothing human-made in that view," she said.

It's an incredible experience, though she admits that by month three she's "staring in this little mirror just to see another human face."

Even her trip to McMurdo this year became a new adventure. Her science group needed to retrieve some instruments off a Ross Sea island that could only be reached by ship. So Turner rode down on a cruise ship and then stayed on to work at McMurdo for five weeks.

Coming into McMurdo Sound by ship instead of by plane was amazing, she said.

"It's like the difference between driving a car through a national park and walking through a national park," she said.

When she leaves the Ice this month, she'll head to a job in a remote spot on the Great Salt Lake, where she'll be "camp mom" and do some GPS work for a science group.

She's not sure what will come next, whether she'll return to Antarctica or try something new.

She plans to do a lot of rock climbing in southern Utah this summer and stay available in the winter, "and just hope that interesting things come up."