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It's a dirty job

Getting a picture of pollution in MacTown

By Aaron Spitzer
The Antarctic Sun

For a month now, Chuck Kennicutt and his research team have been studying McMurdo Station's dirt.

It's not the most glamorous work in Antarctica. It doesn't involve diving with seals, or collecting meteorites, or climbing into a volcano. But it may be one of the most important projects on the Ice.

"We're putting together standards for the environmental monitoring of Antarctic programs," explained Kennicutt, a professor at Texas A&M University.

To that end, Kennicutt and his team have spent since mid-December gathering more than 700 soil samples from around MacTown. The dirt, mud and lava rock will be taken to Texas to be analyzed for pollutants—mostly spilled fuel, vehicle emissions, and construction debris.

Collecting dirt isn't as simple as it sounds. First, in order to prevent sampling bias, the group employs a random-number generator to target a location within the McMurdo Station watershed.

Then, using a GPS unit to pinpoint the site, Kennicutt and his researchers go to the location. They photograph the spot, probe for permafrost, measure the slope of the surrounding land, and finally—using an uncontaminated plastic jar—scoop up a few ounces of topsoil.

The group has also gathered snow near McMurdo's sea-ice transition, collected water in the runoff gullies, and examined physical disturbance to the station's landscape, mainly from the moving of soil for construction.

Next year—phase two of the three-year project—will see the research move offshore, where Kennicutt will study the levels of sewage and other contaminants in nearby waters. He'll also drill down to gather sediment from the floor of McMurdo Sound.

See "Dirt"—Page 4

Out for a waddle

A parade of Adelie penguins visits the sea ice off MacTown Friday. They made a brief stopover near the jetty and then headed toward Cape Armitage. Photo by Jeff Inglis.

A SPARCLE in their eyes

By Jeff Inglis
The Antarctic Sun

Scientists who study gases mostly confine them to flasks in laboratories. Not Stephen Warren and Von P. Walden, atmospheric researchers from the University of Washington in Seattle. They are studying the air out on the polar plateau.

Away from the sterile, controlled environments of indoor research facilities, Warren and Walden have created their own work site right next to the Clean Air Sector. The project is called SPARCLE, the South Pole Atmospheric Radiation and Cloud Lidar Experiment.

"We're studying processes important for climate," Warren said.

In 1985, Warren began examining how sunlight reflecting off snow affects the energy budget of Antarctica. An significant reason for the extreme cold of Antarctica is that snow reflects 83 percent of the incoming solar energy. Warren also looked at the sizes and shapes of the snow crystals themselves to learn why snow reflects sunlight the way it does.

See "SPARCLE"—Page 2

Von P. Walden checks the dimensions of an infrared beam on a reflectometer. The equipment helps measure the absorption of infrared radiation by water vapor in the atmosphere. Photo by Jeff Inglis.

"SPARCLE"—from Page 1

Walden studied the other half of the energy budget, measuring the amount of infrared energy emitted by the different gases in the air, as well as by clouds. He found that even the small amount of water vapor over the plateau was responsible for two-thirds of the natural greenhouse effect here, and carbon dioxide was responsible for most of the rest.

Now they are combining their efforts in a two-pronged attack on a tough problem.

"The most important greenhouse gas, worldwide, is water vapor," Warren said. But nobody has accurately measured how much infrared energy it is capable of absorbing at low temperatures.

This information is vital for predictions of climate change not just in Antarctica but around the world. And conditions on the ground at the South Pole, with temperatures dropping to minus 120 F, are similar to those at high altitude, in the upper troposphere, elsewhere in the world.

Learning more about the interactions between water vapor and infrared energy helps make climate-change models more accurate. While many causes contribute to climate change, Warren said, they come back to one place.

"They either start with radiation or involve radiation," he said.

The team, including graduate student Penny Rowe and research meteorologist Richard Brandt, has devised two different ways to look at water vapor.

One is using the flat expanse of the polar plateau to provide a long path of uniform air. They have an instrument that reports how much infrared energy is absorbed by water vapor in the air. But it can be reconfigured to measure how much infrared energy is emitted by the atmosphere.

Water vapor's absorption, Walden said, is weak in parts of the infrared spectrum. So to measure it accurately requires a lot of water vapor in the air. At high temperatures, it's easy to get lots of water vapor in a small chamber in a laboratory. But such high-temperature measurements may not be applicable to the cold upper troposphere. At low temperatures, the only way to get sufficient water vapor is with a long distance, more than half a mile, of air. Because the plateau is featureless, the air moving across it is usually fairly uniform in terms of wind speed and direction, humidity and temperature.

The other way the team is measuring the characteristics of water vapor is with a tethered balloon. They can send different instruments up with the balloon, to more than a mile high, and photograph ice crystals and measure humidity and temperature.

Most of the water vapor in the atmosphere is in the lowest mile of air. The tethered balloon also allows the team to take sustained measurements at fixed altitudes, which is uncommon. Usually this type of research is done from freely rising balloons or from airplanes, which move quickly through clouds and also may alter the cloud properties.

Their observations are compared with existing models of the atmosphere and its characteristics. In collaboration with other climate modelers, the team's new data can be incorporated into improved concepts of the climate.

The information is also useful for interpreting data from satellites and other remote-sensing devices. The devices can record observations, but to interpret that information requires a knowledge of the processes involved, including how gases absorb radiation.

But Warren and Walden can't observe everything at once. To complete their descriptions of atmospheric conditions, they collaborate with NASA, NOAA and local weather observers.

This summer's research is largely a testing phase. Much of the real work will happen next summer and over the following winter of 2001. Two members of the group will winter at the South Pole to conduct the research, which uses existing tools in new ways. One of the instruments was originally designed to measure pollutants coming out of factory smokestacks. Now it's in use measuring water vapor in Antarctic air.

"We're using new technology to increase our understanding of the Antarctic continent to make better predictions of climate for this region," said Walden.

Richard Brandt attaches an instrument to a tethered balloon. The device will help the team learn about the lower atmosphere. Photo by Jeff Inglis.

Letter to the editors

Hats off to balloon helpers

With Thursday's balloon launch, it is the first time in our ballooning history that we have two flights in the stratosphere at the same time. Many thanks to all the ASA people who assisted with this effort.

A special thank you to the Fleet Ops team who prepared an excellent launchpad surface and showed up for both launches and the launch attempts that were cancelled. I don't know if most of ASA or NSF realizes what a stellar effort is put forth by the Fleet Ops crew to support us.

They are as much a part of the launch team as any of the Long Duration Balloon project personnel.

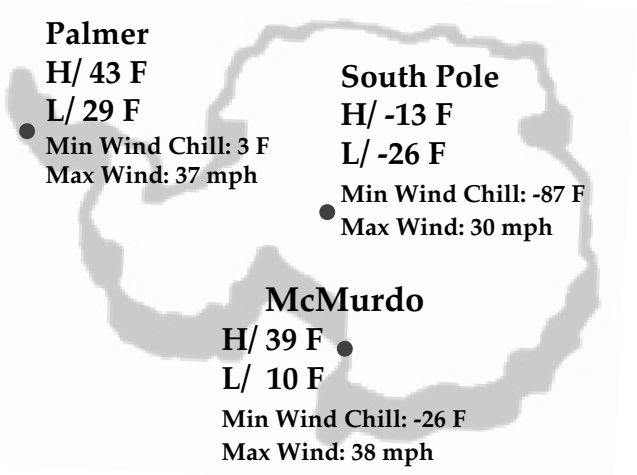
—Steven Peterzen, National Scientific Balloon Facility

Our Antarctic Week

Today
Self-defense class, 6:15-7:30 p.m., Gym
Science lecture: Life at the Freezing Edge: Adaptations to a Sea Ice Existence, by Steve Kottmeier, 8:30 p.m., Galley
Monday
Slide show: Five Hikes on New Zealand's South Island, 8:30 p.m., Galley.
Tuesday
Swing dance lessons, 6:30-8 p.m., Gym
Wednesday
Crazy Homemade Hat Bingo, 8 p.m., Gallagher's. $200 grand prize.
Thursday
Sarah Krall, acoustic music, 8 p.m., Coffee House
Friday
Antarctic Film Extravaganza: 90 Degrees South and IMAX movie, Coffee House, two showings, 8 a.m. and 8 p.m.
Sunday
Scott Hut Race, noon, meet at the Chapel, 4.5 miles, $12 entry fee, free T-shirt
Rugby match, contact Keith, pager 338

If you have an item for the weekly calendar, e-mail us at sun_news@mcmurdo.gov, call 2407, or drop by our office in Building 155.

The week in weather



Pole prepares for winter

This winter will see the largest-ever winter population at South Pole Station. Fifty people—30 scientists and 20 support staffers—will spend the season at the pole, said Scott Hulse, the station's winter site manager.

Hulse, who has worked in remote stations in the Northern Hemisphere for many years but had never been south of the Equator before this season, expects the main challenge to be maintaining a sense of teamwork.

"Management here is unlike management anywhere else in the world," Hulse said.

With a new power plant, a new telescope, and a new dark-sector lab scheduled to be complete by winter's end, the group will have a variety of projects.

"It's going to be an exciting program," Hulse said. He is eager to get started, and says the winter crew is ready to go.

"We are definitely looking forward to the 15th of February," he said, referring to the date the station's winter isolation will begin.

Correction

On page 10 of last week's Antarctic Sun, the photographer for the picture of the four Singaporean trekkers was misidentified. The photographer was Bob DeValentino. The Sun regrets the error.

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Web address: http://www.asa.org

"Dirt"—from Page 1

Finally, in phase three, they will put in place the overall monitoring program—which Kennicutt hopes will be handed off to the National Science Foundation and its contractors.

"Monitoring itself is not of any use unless it feeds back into managing the station," he said.

Though there's already been much testing of specific spill areas in McMurdo, Kennicutt said his is the first effort to conduct a comprehensive survey of the entire base. "We're trying to draw an overall picture of the station," he said.

His work flows from the new-found emphasis on environmental accountability on the Ice. "The impact of human activities has become a central theme under the Antarctic Treaty," Kennicutt said.

And of course MacTown, the target of intense criticism from environmental groups in the 1980s, is a natural focus for Kennicutt's work.

"McMurdo, being the biggest of the big, has gotten a lot of attention," he said. "A lot of what we're seeing is the continuing legacy of how things were done in the past."

And though Kennicutt admits that "Today it's like night and day compared to how things were done 10 years ago," he points out that simply due to the size of the U.S. Antarctic Program, the potential for detrimental impact remains.

Chuck Kennicutt, Diana Alsup and Andrew Klein take a soil sample from a hill above McMurdo Station. It was one of 700 collected this season. Photo by Josh Landis.

But he praises the level of cooperation he's received from station personnel. "There's been a lot of interest in what we're doing," he said. "Most folks are environmentally positive."

And Kennicutt sees the work he's doing eventually traveling beyond the boundaries of MacTown. "It is hoped that the lessons learned here will be extended to Palmer Station, the South Pole, and also the field camps," he said.

South Pole update

By Tracy Sheeley

South Pole station is flying high into the year 2000 with a continuing high pace of scientific research and construction activity.

Our most unusual arrival of the New Year was the highly anticipated Russian snow-buggy brigade. They rolled in on January 8 at about 8 p.m. A large group was on hand to greet them, and it was quite a sight-they burst out of the brightly colored buggies, very happy to see the crowd.

They called for five brave volunteers, had them lie down in the snow, and-to the delight of the onlookers-rolled one of the buggies right over them.

They immediately set to the task of inflating their hot-air balloon for the first ever launch of one at South Pole. The sight of it was a colorful contrast against the white polar plateau! The Argentinian expedition was still on station for their arrival, so we had quite a diverse population overnight. Both expeditions departed the next day.

Another variety of balloon has been flying in recent days-this one to measure the near-surface humidity profiles and properties of low clouds and diamond-dust ice crystals. The balloon measures 22 feet by six feet, is powered by helium and is launched upwind of the station.

Getting back down to Earth, the construction in the powerplant arch marches along. The summer's work will include completing the 200 foot arch, building shell framing, placing the generator, and erecting the vertical tower, which will provide the connection from the sub-surface industrial buildings to the Elevated Facility. Winter-over interior construction will allow for completion of the new power plant next January. The new weight room in Summer Camp and a new bathroom in our upper galley have also been completed.

And, below the surface, the length of the tunnel has reached about 800 feet of its expected 1,300-foot-length. The tunnel will serve the new station both for the sewer outfall and Rodwell. In other underground (undersnow) news, the Polar Ice Coring Office is nearing completion of its drilling for the season. They are drilling the fifth hole now, and AMANDA has deployed their fourth string. The project is on schedule to complete the six holes planned for this season.

In the first two weeks of January, Pole broke four minimum cold records. Station closing is planned for February 15, so we have four more action-packed weeks ahead.

PIER REVIEW: BUILDING A DOCK OUT OF WATER

By Bob Hanes
Special to the Sun

Within the next seven weeks McMurdo will be visited by the U.S. Coast Guard icebreaker Polar Star, the Nathaniel B. Palmer research vessel, the tanker Richard G. Matthiesen, the supply ship Greenwave, and cruise ships scheduled to stop for passenger tours. MacTown will be a very busy place and some of these ships will need a pier where they can dock.

Since McMurdo is the southernmost port on Earth we are also privileged to have the only ice pier on Earth. Why an ice pier? You'll note there are no docks, piers or any other permanent structures in Antarctic waters because the thick sea ice and the rising and falling tides destroy any attempts at permanency.

Construction on the ice pier began early in the winter season. Photo by Josh Landis.

According to Bill Haals, who supervises the construction of the ice pier and has done so for over 10 years, the pier at McMurdo is the only one of its kind in the world. He said there are many different ways people think the ice pier is constructed, but seldom has he heard anyone who knew exactly.

The sea ice, at the location where the pier will be constructed, is only about two feet thick when the project gets underway in April. Throughout the winter the ice increases in thickness to around seven feet.

The area covered by the ice pier is slightly smaller than a football field. A one-foot wall of snow and ice is built around the outer edge of the pier area. Two permanent submergible pumps are spaced at an equal distance along one long side of the potential pier. Each pump is capable of pumping 1,600 gallons of seawater per minute into the area bound by the wall. This area within the wall is flooded to a depth of four inches of seawater. If the weather is very cold the water becomes ice by morning, at which time the process is repeated again and again at four-inch thicknesses or once every 24 hours.

After the ice reaches a total depth of 10 feet, a 6,000-foot-long, one-inch diameter cable is laid out in a rectangular pattern over the surface of the ice. There are four heavy, long posts, known as bollards, which have been built into the ice pier, plus at least four or five other posts on permanent land. The cable—through a series of twists and turns—is anchored to the land posts. Additional four-inch layers of seawater are added until there is another five more feet of ice. At that time another 6,000 feet of one-inch cable is again laid out in a rectangular pattern.

More layers of water are added until the depth of the ice has reached 20 feet. Upon reaching that depth, the next step involves spreading a six-inch insulating layer of local volcanic rock on the pier surface. A heavy-duty, portable metal bridge, about 40 feet long, is then placed in position and connects the land to the pier.

The reason the seawater is transformed into ice fairly quickly is because in very cold weather, the salts leach out of the sea ice, creating fresh-water ice.

The final step involves drilling holes about a foot apart all the way around the edges of the ice pier. This would be similar to perforating a piece of paper. The paper is weakened at the perforation and thus tears more easily where you want it to tear. The tide works in a similar manner for the ice-pier construction workers. When the tide goes in and out, the pier breaks away from the surrounding sea ice, where the drilling took place. Then the ice pier will float on its own.

The first experimental ice pier was designed by the Navy's civil engineering lab and constructed by McMurdo's 1972 winter-over crew.

Now it's an annual project that will soon be put to good use.

Faces on HIGHWAY 1

What are you planning to do after you leave the Ice?

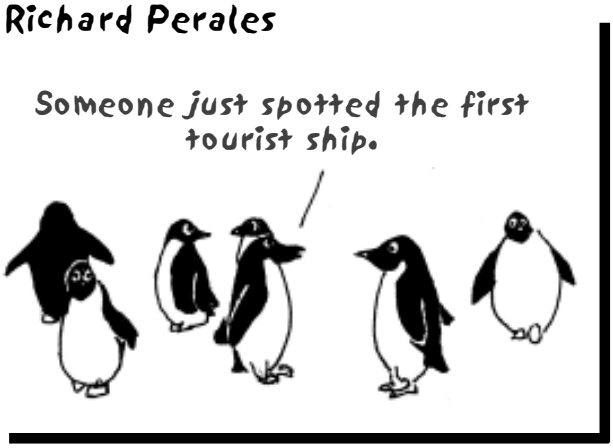
"Sleep, lay in the sun and take the barf barge to Palmer."
Heidi Geisz
general assistant

"I'm going to run a race across the Sahara."
Lisa Berry
South Pole cargo handler

"I plan to take over the world one Third World country at a time."
Anner Charrier
housing coordinator

"I'm planning on spending several days in the cold chamber of the Antarctic Centre in Christchurch to readjust."
Bryan Johnson
air services

Ross Island Chronicles
by Richard Perales



Contribute to McMurdo's Millennium Time Capsule!

Seeking small mementos, images, journal entries, etc., to commemorate the millennium and to be opened in 25 years. Bring to the McMurdo Historical Society meetings, Sundays at 6:30 p.m. in the Library, or contact Ed Anderson at andersed@mcmurdo.gov. Deadline is January 20.

Speaking of Science...

Antarctic snows rife with life

By Ed Carpenter
Special to the Sun

The next time you step in the snow you might consider who you're stepping on. The snow around McMurdo Station contains many microbes, including bacteria and microscopic algae. The algae consist of species that are photosynthetic and adapted to life in a cold environment.

There are several hundred species of snow algae worldwide, and at times in some alpine regions they are dense enough for their photoprotective pigments to give the snow a red or pink hue. Some areas in Antarctica, such as Palmer Station, are mild enough for pink snow to occur, but typically such accumulations are unusual in Antarctica.

The snow in the cold interior of Antarctica contains bacteria and some microscopic algae, but it is thought that they are inactive. In this arid and cold environment one might compare them to being "freeze dried." However, recent NSF-funded research from snow collected at South Pole Station suggests that bacteria in the snow are alive, actively metabolizing and uniquely adapted to their harsh environment.

Pilar Heredia, a SUNY Stony Brook research specialist, transfers South Pole snow from a storage box in a Crary Lab freezer to smaller containers. The snow is kept at 5 degrees Fahrenheit until it is sampled for organisms. Photo by Josh Landis.

Typical bacterial cell concentrations are around 1,000-5,000 per milliliter of snowmelt. DNA sequencing of bacteria collected at the Pole last year indicates that many of them belong in the genus Deinococcus.

This fascinating organism was first discovered when it turned up alive in the 1950s in cans of supposedly sterilized gamma-irradiated meat. Subsequent research indicated that this organism could withstand a whopping 12 million rads of radiation (humans die with exposure to 1,000 rads).

Deinococcus was found to have remarkable DNA repair mechanisms, and the organism carries four copies of its genome to use as a template to repair radiation-induced breaks in its double-stranded DNA. What is puzzling is why this organism has evolved such a strong DNA repair system. At first thought, there would appear to be no place on Earth, except inside a nuclear reactor, where it would have evolved such abilities.

But things begin to make sense when we consider that it could have evolved in the snows of interior Antarctica. Life in an extremely dry environment, particularly with a high flux or ionizing radiation from the sun, can damage DNA just as radioactivity would. Thus the radiation resistance may be a side effect of its protection of DNA breakage induced by extreme desiccation.

Another challenge faced by organisms living in extreme cold is finding liquid water to carry on metabolic processes. Recent studies by ice physicists have shown that there can be an extremely thin layer of liquid water on all snow and ice crystals down to minus 38 F. This layer, about the thickness of a bacterium, may be just enough water for survival of organisms like Deinococcus.

Research on polar bacteria is being carried out by Pilar Heredia and me, from the State University of New York at Stony Brook, Doug Capone from the University of Southern California, and Senjie Lin from the University of Connecticut. Known as the "snow buggers," the group collects the snow at Pole, then analyzes the microbes at McMurdo's Crary Lab.

The group has used radioisotopic tracer techniques to measure rates of protein and DNA synthesis in the South Pole snow, and all measurements so far indicate that the bacteria are active at typical summer snow-surface temperatures (about minus 9 F). This season the group is adding a number of additional techniques for measuring metabolism.

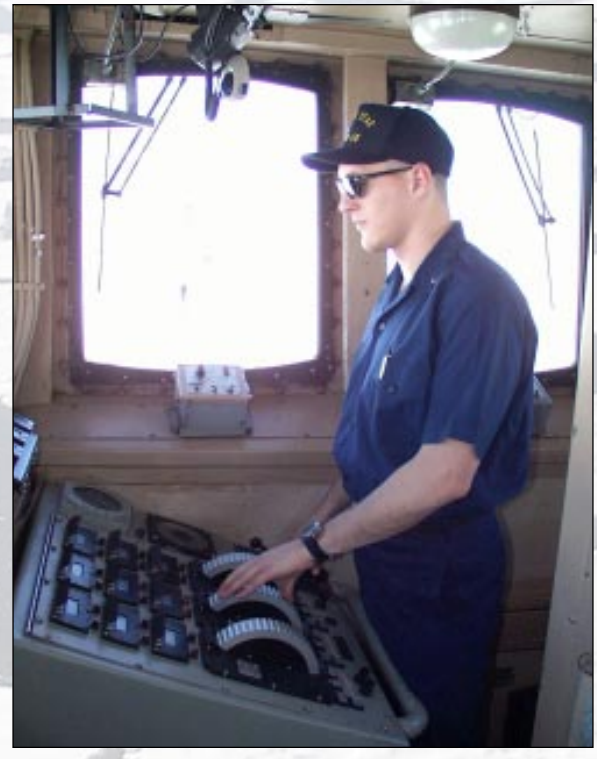
This research essentially extends the limits for life on Earth. It had previously been thought that the interior of Antarctica was essentially lifeless (except of course for invasive humans and the rare skua), but the next time you stomp on a patch of snow you might consider that you are stepping on some pretty tough critters.

On the cutting edge

The U.S. Coast Guard Cutter Polar Star arrived at the fast-ice edge of McMurdo Sound on December 27 and began breaking open a path that will allow fuel, supply and research ships to reach McMurdo Station.

This year the ice edge extended almost 37 miles from the station. The distance can range anywhere from nine to 57 miles, depending on the weather.

A tanker, named the Richard G. Matthiesen, is scheduled to arrive late this evening to resupply the station with fuel. In February the Greenwave and Nathaniel B. Palmer will also be pulling into the waters of Winter Quarters Bay.



More than a hundred feet up, the aloft-control is the driver's seat of the icebreaker. There are three throttles—one for each propeller shaft—diagnostic displays and a four-inch dial that controls the rudder.

"We steer the ship from here because it gives us a better view of the ice," said Lt. j.g. Matt Funderburk, pictured right.

Near the top of the mast, the aloft-con shudders with each icy encounter. With 399 feet of ship slamming into miles of unrelenting ice, something has to give. The Polar Star wins the battle with the ice, but it pays a price, too.

"The biggest nemesis to this ship is vibration," said boatswain Keith Raisch. That vibration can rattle bolts loose, short out electrical systems and even cause the engines to shut down.

Once the Polar Star has cut its path through the sound, there isn't much danger in the channel to the ships that follow. The brash ice floating around moves aside, for the most part, and actually serves as a buffer between the skin of the non-icebreaking ships and the fast-ice edge.

"The main thing is to keep the channel straight so the tanker can get through," said boatswain Keith Raisch.

It's an ongoing job. Recently a large piece of fast ice came loose, blocking off the channel, requiring the Polar Star to return and clear the way once again.

The Polar Star breaks ice in the Antarctic and the Arctic. The ice up north is thicker and stronger because it accumulates for years, while the water of McMurdo Sound freezes anew each winter.

The ship has three diesel engines and three turbines, which can be used in any combination to drive the three propellers. The turbines are more powerful, but also use a lot more fuel. Running on turbines, the Polar Star can break ice that's six feet thick without stopping. Diesel engines—which actually power generators that drive electric motors—can push through a thickness of four feet.

Using a back-and-ram approach, the ship can crack ice up to 21 feet thick.

"A 400-foot machine is what it is," said Cmdr. Stephen Wheeler, the ship operations manager.

Two helicopters, supported by more than a dozen crew, operate from the Polar Star on reconnaissance and science support missions. On the latest cruise, research scientists worked on weather, sea ice, biological, atmospheric and geologic projects while en route to McMurdo Sound.

By Josh Landis
The Antarctic Sun
Photos by Josh Landis and Aaron Spitzer

The crew of 150 has been sailing since November 2, when the ship left its home port of Seattle. It will remain here until the Greenwave leaves and the Nathaniel B. Palmer research vessel takes on fuel, which it must get from the Polar Star.

Right, a member of the helicopter landing crew gets some rest on the landing pad.

On its way north the ship will stop in Australia, Tahiti, Mexico and San Francisco. It will return to Seattle between the middle and end of April, nearly six months after it departed.

PROFILE

Out of Africa: A polar researcher

By Jeff Inglis
The Antarctic Sun

Outside an elevated building near the South Pole, an Egyptian flag flaps in the polar wind. It belongs to Ashraf El Dakrouri, a laser scientist at the Aerophysical Research Observatory at South Pole Station.

El Dakrouri is the first Egyptian at the South Pole. For that matter, he pointed out, he is the first person from either an Arab or a Muslim nation to go to the South Pole.

It's a long way from Cairo to 90 degrees south, and El Dakrouri plans to winter at the pole as part of his research on the temperature of the mesosphere. He's never done anything quite like this before.

"I don't know what will happen," El Dakrouri said. But he is in good spirits and is looking forward to the challenge. The experience may be even more difficult for him than for most pole winterovers.

El Dakrouri was married only a year and a half ago. He and his wife have a 6-month-old son in Cairo. They live with her family, and with his also nearby, there is plenty of help available.

"She lives with a lot of people, not like me," El Dakrouri said.

He asked his wife about the possibility of his coming to the South Pole. She was initially reluctant, he said, but she eventually agreed, on the condition that he call every week. He does, using the phone facilities available each weekend.

Being away from family is tough, El Dakrouri said. But being able to do this sort of work, and being a pioneer for African Antarctic research, are important, too, he said.

It has been especially difficult to be away from home recently, during the Muslim holy month of Ramadan. It is a time of fasting and then feasting, usually with family. El Dakrouri is alone this Ramadan.

"The Egyptian people prefer to spend Ramadan in Egypt," he said. "Next year I will spend Ramadan in Egypt."

The year after that, he things he might come back to Antarctica the following year.

Ramadan has been strange for El Dakrouri, too, since eating is forbidden between sunrise and sunset. In a land with 24-hour daylight, that doesn't quite work.

He knew he would have to deal with this, and asked religious leaders in Egypt what to do. They told him he could use the time of sunrise and sunset in the nearest country, so El Dakrouri is using New Zealand.

The fast is longer here, because of the higher latitude of New Zealand. In Egypt, he said, the time between sunrise and sunset is usually 12 to 15 hours, but here it is nearly 18.

"I try to sleep," El Dakrouri said of how he spends his fasting time.

The galley staff at the station accommodate his unusual mealtimes, and help him avoid pork, a forbidden food for Muslims. They sometimes make a separate portion for him so it's hot when he comes in to eat around 8 p.m.

Ramadan recently ended. Instead of the traditional celebration marking the end of the month, El Dakrouri did something a bit different.

"I try to make something fun for my feast," he said. He headed to McMurdo for a couple of days to telephone his friends and family in Egypt.

He will return to Egypt at the beginning of next summer, to report back to the National Institute of Laser Science in Cairo, where he is a researcher, and to return to his teaching duties at Cairo University.

He feels some pressure now, though. Not only is his work new research, but he wants to become a better instructor as a result of his time here.

"I must take something higher to teach the students afterward," El Dakrouri said. "A lot of students have a lot of ideas."

He wants to encourage them to follow their dreams. He also hopes to make a good impression on the U.S. program and on his fellow researchers. He believes he is a representative of scientists from Egypt, Africa, and the Arab and Muslim worlds, who may one day work in Antarctica too.

"If you are the first person to so something, you want to do it very well," El Dakrouri said. "I am a beginning. I hope a lot of people come after that."

Ashraf El Dakrouri practices pool, a game he learned from his new friends at the South Pole Station. Photo by Jeff Inglis.