



November 9, 2003

## South Pole, do you copy?



Photo by Kris Kuenning/The Antarctic Sun

MacOps operator Melanie Conner does a high frequency radio check with the South Pole Station. High frequency radio communication was replaced by Iridium satellite phones during blackouts caused by solar flares last week.

# Great balls of fire

## Record-breaking solar storm silences communications

By Kris Kuenning  
*Sun Staff*

Last week, the McMurdo communications hub was unusually quiet. Normally MacOps and MacRelay are buzzing with the crackle and hum of high frequency radios, which serve as the primary communication link between McMurdo, the Amundsen-Scott South Pole Station and the U.S. Antarctic Program's outlying field camps.

All week, the high frequency radios were

dead. There was nothing but a gentle hum.

"That's the sound of a very quiet ionosphere," said MacOps coordinator Shelly DeNike.

The ionosphere is the layer of charged particles in the upper atmosphere that bounces high frequency radio waves over the horizon. The silence at MacOps was the result of a solar storm wreaking havoc.

Every day, MacRelay coordinator Carey

See Solar Flares on page 8

# Marshian investigation

By Brien Barnett  
*Sun Staff*

Groundbreaking work in marine genomics is taking place at McMurdo's Crary Lab in an office staffed by "Marshians."

Principal investigator Adam Marsh of the University of Delaware and his team of research students are in the first of a three-year study of the cold weather adaptive capabilities of sea urchins and starfish that live in McMurdo Sound.

The goal is to decipher the specific mechanisms that trigger embryonic development under the strain of the  $-1.5$  C environment in which the organisms live and spawn.

The sea urchin embryos, in particular, are spawned in the austral summer and take about a year to develop.

Marsh wants to know whether those mechanisms are more or less complex because of the cold environment. He's adapting genomic techniques he learned and refined over the course of four post-doctorates in search of the answer.

The team dives almost every other day, Marsh said. Samples come from areas under the fast ice in McMurdo Sound, such as cinder cones. The live urchins are transported back to the Crary aquarium and placed in buckets playfully labeled "Marshian Larvae."

The "Marshians" are spending

See Marshians on page 10

## INSIDE

We apologize that due to technical difficulties, copies of the Sun will be limited this year. Please share. A PDF of the paper is also available on the McMurdo Intranet.

Women crack the ice barriers

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## Quote of the Week

"It's important to have a good hat here because every day is a bad hair day."

- A marine biology researcher

Ross Island Chronicles

By Chico



# Cold, hard facts

## Getting to the Ice

- Annual average of passengers flying from Christchurch to McMurdo: **3,003**
- Average number arriving Antarctica by ship: **400**
- Average number of Christchurch to McMurdo flights, including Winfly: **110**
- Average per passenger bed nights in Christchurch: **2**
- Passenger time in Christchurch this year because of delays: **up to a week.**
- Total number of bednights used in Christchurch last year: **31,000**
- Flights leaving on schedule as of Nov. 2: **79%**
- Flights boomeranged: **nearly 24%**
- Factors causing delays, in order of frequency: **Weather, aircraft maintenance, solar flares disrupting communication.**

**Sources:** Ray Gabriel, USAP Transportation Planner; Lynn Dormand, Manager, Deployment Specialists Group; Phil Ambler, Manager Terminal Operations.

**Correction:** These facts correct a wrong number run in some versions of the Nov. 2, 2003 Antarctic Sun on page 13.

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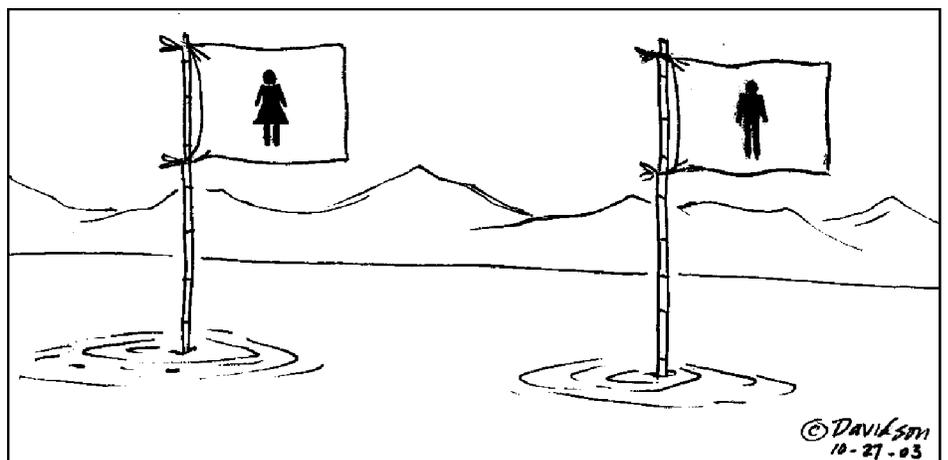
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# Leopards of the sea

*Seals inspire  
caution and  
admiration*

*A curious leopard seal  
cruises by, checking  
out the photographer  
during a dive near  
Palmer Station.*

Photo by Dan Martin/Special to The Antarctic Sun

By Kristan Hutchison  
*Sun staff*

**People and penguins react the same when a leopard seal swims by. They get out of the water.**

It's a natural response to meeting a predator the size of a cow with serrated teeth and canines up to 2.5 cm long.

"Usually the seal just seems curious, but when you've got a 10-foot-long (3 meter) predator a few feet away from you, you do worry he might get curious about what you taste like," said Chuck Amsler, a biologist who dives at Palmer Station.

This past winter a leopard seal did attack a science diver who was snorkeling near Rothera, a British research station on the Antarctic Peninsula. The researcher, 28-year-old Kirsty Margot Brown, was pulled under and drowned on July 22.

It was the first time a leopard seal has caused the death of a person. Despite the attack, Amsler feels Antarctic waters are relatively safe.

"In thirty-some years of people diving all over the Peninsula, there's been one attack," Amsler said. "I'm in an urban university and we've had people killed walking across the street, but I still walk across it to go to the library. I just look both ways."

Though leopard seals have never attacked before, divers around Palmer Station have always treated them as potentially dangerous animals. The dive tenders keep an eye out for leopard seals and if one is spotted in the area, the dive is called off.

If the divers are already in the water, they generally back slowly up to a cliff or wall, so they don't have to worry about the leopard seal surprising them from behind.

"Most of the places we're diving are very steep," Amsler said. "You get out as

soon as possible, but you don't frantically run away like game that's been flushed."

In 80 dives last year, Dan Martin met leopard seals underwater about five times. He began to recognize individual leopard seals. One was particularly curious.

"This one guy would just come closer and closer until he was close enough to touch," Martin said. "I could have scratched his chin."

To Martin, the leopard seals have an almost dog-like demeanor. But unlike dogs, little is known about their behavior or how they react in a given situation. Martin has noticed that when he's seen leopard seals down deep they generally circle from a distance, watching. As he rises toward the surface, the seal's circle often tightens.

Though leopard seals rarely threaten humans in the water, they do have a taste for the inflatable rubber boats frequently used around Palmer Station.

"They tend to just gnaw on them like a teething baby," said Doug Fink, the boating coordinator at Palmer Station. "You don't find things torn apart as much as you do scrape lines and pinpoint holes from their sharp teeth."

In one week last year, leopard seals punctured four of the boats. Fink instructs boat operators to leave the seals alone and to take any sign of aggression or curiosity on the seals' part as a signal that it's time to leave the area.

Penguins have more reason to fear leopard seals than people do. Though leopard seals are primarily krill eaters, they get a taste for penguins and are skilled hunters who always seem to get their prey.

"The only way a penguin gets away is if it gets to shore," said Susan Trivelpiece, a bird biologist on King George Island.

The leopard seals often start patrolling offshore of the penguin colony about the

time the penguins start making frequent trips in and out of the water to feed their chicks. The seals will hide behind icebergs or work in pairs to catch the penguins.

Like cats, leopard seals sometimes appear to hunt for the sport of it, playing with their prey. Trivelpiece once watched for 45 minutes as a seal caught a penguin, over and over again. The seal had already killed at least a dozen penguins that day, so it clearly wasn't hunting out of hunger anymore. Like a cat with a mouse, the seal would grab the penguin and drag it underwater briefly. Half a minute later, the penguin would reappear, looking dazed and start swimming for shore. For a few moments the seal would follow lazily behind, then catch the penguin again.

"We were rooting for the penguin toward the end, because the leopard seal didn't care if he ate it," Trivelpiece said.

Leopard seals have their fans too. Their sleek bodies are a silvery dark gray color with interesting spotted patterns, which lead to them being named after the spotted African cat. The seals live in the pack ice all around the continent and can live more than 26 years. They reproduce from September to January and by most recent estimates number about 220,000.

Unlike other seals, the leopard seals use their large fore-flippers while swimming. Divers who have seen them underwater describe leopard seals as graceful and impressive.

"In terms of just seeing one on land, the coloration and shape, in many ways you might say they're more beautiful than say, the elephant seal," Amsler said. "Underwater, the leopard seals are very maneuverable animals that can twist and turn. If you weren't worried about the business end, they would be fun to watch."



## Perspectives Perspectives

# Ice history from the Kiwi perspective

By Baden Norris

**D**ecades before the U.S. and New Zealand Antarctic stations became neighbors on Ross Island, Kiwis were cooperating with expeditions from other countries to explore the Antarctic.

As the final port call before sailing to the Antarctic, New Zealand was the place where expeditions stopped to pick up additional supplies, including crew members.

Captain James Cook of the British Royal Navy first established a link between Antarctica and New Zealand during the first circumnavigation of the continent in 1773-74. During his historic feat he spent the first winter in his ship *Resolution* at Dusky Sound, in New Zealand's Fjordlands. Evidence of this winter can still be seen in Facile Harbor in the form of tree stumps used to moor the ship. The Lyttelton Historical Museum houses two bottles found there.

It was a long time, however, before the first New Zealander entered the southern polar regions and he was there as a service of the U.S. Navy.

Captain Charles Wilkes led the United States Exploring Expedition of 1839-40. He must have been the most reluctant explorer ever, agreeing to lead the expedition only after several others refused. He was a brilliant cartographer and proved equal to the task.

Aboard Wilkes' ship, *Vincennes*, was a young seaman who was known as John Sac. His true name was Tuati, the Maori pronouncement for Stewart, and his veins carried Maori and European blood in equal volume. The son of William Stewart and his Nga Puhī wife, Tuati had reached the U.S. aboard a whaling ship in the mid 1830s, having quickly learned the seaman's craft as a crew member. His name had proved too difficult for his shipmates to pronounce, so he acquired the new name of John Sac, a name he carried for the rest of his seagoing career.

Wilkes took his ship, a 24-gun corvette of the U.S. Navy, to the coast of Antarctica and charted (not always cor-



Photo by Kris Kuenning/The Antarctic Sun

*Some of the original Scott Base buildings, which now serve as a museum.*

rectly) 3,400 km of shore. He was the first man to recognize that beneath the mantle of ice lay a continent. It was a notable event in the long history of the area and a New Zealander was part of it.

Although a historic figure, Tuati appears to have escaped the attention of most historians in New Zealand. All that is known is that he took his family to Hawaii on his return to the Bay of Islands and faded from the scene.

The first New Zealanders to land on the continent were among a group of Norwegian sealers who landed at Cape Adare on January 18, 1895. The group included a Norwegian named Borchgrevink, who later led an expedition back there.

This landing is believed to be the first on the continent, although there is evidence of landings on the Antarctic Peninsula that may predate this.

The four Kiwis, Alexander von Tunzelman, George Lonnecker, William Joss and George Chevalier, all joined the sealer *Antarctic* at Port Chalmers after crew trouble left the ship undermanned. All four came from Stewart Island, New Zealand's third largest island, which was

named after William Stewart, Tuati's father. Once again, the Kiwis were present at a notable Antarctic event, yet in both cases serving another country.

Clarence Hare was the only New Zealander to serve on the *Discovery* during Captain Robert Scott's National Antarctic Expedition of 1901-04. This 21-year-old joined the British ship in Lyttelton and spent the first year on the ice at Hut Point before being returned to New Zealand by relief ship. This relief ship *Morning* did have New Zealanders among her crew, including several Lyttelton residents. A number of men from Lyttelton also served on Ernest Shackleton's *Nimrod* in 1907-09. Scott's *Terra Nova* also carried 19 New Zealanders among its crew during the 1910-13 expedition.

By 1917 and the closing of the heroic era of Antarctic exploration in the Ross Sea area, at least 24 men from New Zealand had visited the southern polar regions. With the arrival of the Norwegian whaling fleet based in Stewart Island, many men from that island served aboard the ships between 1924-30. Another 57 Kiwis served the U.S. during the expeditions of Rear Admiral R.E. Byrd and three wintered over.

It was the International Geophysical Year (IGY) and the Commonwealth Trans Antarctic Expedition that prompted the New Zealand government to get involved in its own right.

In 1956 Sir Edmund Hillary and his team of New Zealanders headed south to erect a base on Ross Island near McMurdo Station. Named after a British explorer, Scott Base allowed the men from New Zealand for the first time to work in the Antarctic under their own flag. New Zealand's part in Antarctic affairs has progressed continuously ever since.

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*Baden Norris is the Emeritus Curator of Antarctic History for Canterbury Museum and the Lyttelton Historical Museum.*

# around the continent

## SOUTH POLE

### First impressions

By Vincent Scott

*South Pole correspondent*

New arrivals at Amundsen-Scott South Pole Station had a variety of impressions of their new home and work place. They were impressed not only with the station and the environment and their jobs, but especially with the people.

Here are some of the things said since they arrived Oct. 25:

“Now I’ve breathed the cleanest air in the world and that’s quite a privilege,” said Sean Hufstetler, a communications technician from Panama City, Fla. “Oh, and the water’s good too.”

Eyvind Flater was impressed with the size of the facilities. “It’s more spread out than I anticipated,” said Flater, a satellite technician from Aurora, Colo. “I’ve seen the aerial photos before, but you just don’t get the whole picture from those.”

Another newcomer to the Pole is Cori Hayth from Bishop, Calif. Hayth is a general assistant and was also impressed with the size of the station, but observed that, “Even though the station is spread out, the community is close knit. And there are good parties!”

Coming from an Alaskan climate is diesel mechanic Isaac Parker. Parker was very impressed with the station. “The dome is pretty neat. It’s huge. Do a lot of women work here?”

Robert “Con” Scott, a first time explorer from Outlands, England, was pleased upon seeing his name here at the station, “Those good chums spelled my name correctly – bully for them!”

Susan Weber is a first-year janitor for the station from Grand Marais, Minn.. Upon disembarking here at Pole she was heard to exclaim, “Now this is Antarctica!”

The Pole’s new physician’s assistant is Troy Wiles from Frankfurt, Mich. Wiles states, “I’m impressed with the new station and old station and the whole site rising out of the snow. Things here are very

well organized and everyone seems motivated for their tasks. It’s definitely cold too!”

Two of our new dining assistants are Navah Levine from Somerville, Mass, and Sheri Mason from St. Louis, Mo. Levine’s first thoughts were “Wow, it’s very white here. Where are the palm trees?” Mason’s first impression was of a more practical nature: “Don’t walk into the propeller. Don’t walk into the propeller.”

## PALMER

### Adelies everywhere

By Kerry Kells

*Palmer correspondent*

Beginning with the top of the food chain in the Southern Ocean, I spoke with two team members with Bill Fraser’s group. Fraser is a principal investigator with a research history at Palmer Station that exceeds 20 years. His two main projects include the study of how global climate change affects Adelie penguin breeding and foraging ecology and the study of the impact of humans on Adelie populations.

Our seabird researchers currently on station include Heidi Geisz, the field team leader and team members Cindy Anderson and Dan Evans. Known collectively as “The Birders,” they work together on the many aspects of this research. While other seabird species are studied—giant petrels, blue-eyed shags, south polar skuas, brown skuas and kelp gulls—funding for the project is primarily for Adelie penguins. The birders conduct visits to different islands within our 3.2-km boating limit to study several Adelie penguin populations at indicator colonies (colonies or sites where long term data has been collected). They count colonies to determine population numbers for adult Adelie penguins and measure reproductive success based, in part, on number of eggs present, and the number of fledglings. Torgersen Island and Humble Island are visited every two days. Every five days, the birders drive



Photo provided by Fraser research team

*Cindy Anderson weighs a bird while Heidi Geisz writes notes near Palmer Station.*

Zodiacs out to the islands of Litchfield, Cormorant and Christine to study the penguin colonies that inhabit these islands. Long-term studies have shown that local Adelie penguin populations appear to be in decline.

Torgersen and Litchfield are two islands chosen for study many years ago because of their similarities in size and adult penguin numbers. Torgersen is unique because it has a control side (where visitors are not allowed to go) separated from a human side (open for tourists and visitors) by a flag line. The bulk of human impact is on Torgersen Island. Litchfield Island, however, is completely protected from visitor and tourist impact under the Antarctic Special Protected Area Restriction. Surprisingly, penguin numbers at Litchfield have declined more rapidly than at Torgersen, which indicates the situation may be more complex than originally thought.

**See Palmer on page 6**

## the week in weather

### McMurdo Station

High: 25 F/-4 C Low: -6 F/-21 C  
Wind: 29 mph/47 kph  
Windchill: -53 F/-47 C

### Palmer Station

High: 37 F/2.6 C Low: 21 F/-6 C  
Wind: 61 mph/96 kph  
Windchill: 5 F/-15 C

### South Pole Station

High: -25 F/-32 C Low: -57 F/-49 C  
Wind: 13 mph/21 kph

# Palmer From page 5

Our field team of birders will continue throughout the summer season to make their almost daily trips to the Adelie penguin colonies scattered around Palmer Station. Local ecosystems, climate changes, and human impact are all parameters affecting Adelie penguin numbers. Other Adelie research projects include penguin movement, feeding locations and food composition (nutrients). Moving beyond the islands within our sight, penguins of the Southern Ocean are studied further on research vessels throughout the year.

water at the surface and various depths below, along with bucket casts and net tows. On Nov. 2 a circuit breaker tripped, shutting off power to the heat tape that keeps the incubator drain from freezing. With no drain lines, the incubators quickly overflowed, creating massive ice sculptures on the helo deck, to the dismay of all involved. Many people turned out at about 5 a.m., with chippers, scrapers and heat guns in hand. By 10 a.m. most the incubators were chipped out and back on line. The incubator system was eventually replumbed for better cold weather survival and all incubators are running free and clear, no ice forming inside or out.

On Nov. 3 the engines made an ominous noise, which proved to be caused by the two starboard side engines racing up from idle, resulting in the failure of some bearings. The engineers set about fixing the problem. While the ship sat still, the researchers continued testing instruments and running the regular morning measurements, deepwater tests, net tows, and bucket casts.

*The Laurence M. Gould was at the Punta Arenas dock on a port call all week.*



Photo by Kris Kuenning/The Antarctic Sun

*Floyd Trujillo, an equipment technician from Silverthorn, Colo., descends from changing equipment on the Nathaniel B. Palmer.*

## SHIPS

### N.B. Palmer enters ice

From sitreps by Don Michaelson

The *Nathaniel B. Palmer* crossed latitude 60 south on Oct. 30, north of Cape Adare. By lunchtime the next day the ship was starting to get into bits and pieces of ice. Passengers scampered up to the bridge to have a look.

We've passed over into the land of perpetual sunlight - if only the fog would clear.

The ship continued south, measuring the salinity and temperature of

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# Continental Drift

**How do you describe Antarctica to people back home?**



**"I just read them the brochure. It's the highest, driest, coldest...."**  
Chris Vitry  
*Palmer Network Administrator from Denver, Colorado, fourth season*



**"[Antarctica is] like no other place on the planet. It's really beyond description."**  
Scot Jackson  
*South Pole cargo from Silverton, Colo., third season*



**"Antarctica in the winter is easy to describe - cold and dark. In the summer, I leave it up to their own imagination."**  
Laura Tudor  
*McMurdo science tech from San Francisco, second 13-month season*

# Women come to Ice as equals

By Kristan Hutchison  
*Sun staff*

**N**avy guys used to say there was a woman behind every tree in Antarctica. Now it would take a forest to hide all the women working in the U.S. Antarctic Program as researchers, trades people, managers and other positions.

"As far as I can tell it's not even a question if you're a man or woman," said Cara Sucher, Palmer senior assistant laboratory supervisor. "It's if you can do the job."

A conference on Women's Roles in Polar Regions last month celebrated how far women have come since melting the ice ceiling 34 years ago. Sponsored by the American Polar Society, the conference at the Byrd Polar Research Center in Ohio drew nearly 100 people, said conference co-organizer Kristin Larson, herself a veteran of several summers and winters on the ice as laboratory manager.

"We shot for the Moon, but we made it to Mars," Larson said of the conference. "It was just amazing, not only the scope and breadth and accomplishments of our speakers, but the participants too."

The conference participants included Edith Ronne, who became the first woman to spend a winter in Antarctica in 1947; an elder from Barrow, Alaska, who gave an invocation in Inuit; and a 13-year-old girl who had visited both Poles.

"One of the things that really came out was that in communities that are harsh and where survival is much more difficult, traditional women's roles are much different than they are in more temperate regions because nothing is superfluous," Larson said. "Everybody has to be useful. If you're good at driving Cats, it doesn't matter if you're a boy or girl, you get the job, and the same is true up in the Arctic. If you're good at throwing harpoons, it doesn't matter if you're a girl or a boy."

It didn't start that way. It took women 58 years after Amundsen to reach the South Pole. When Colin Bull first started leading expeditions to Antarctica in 1958, it was a men-only club run by the Navy. He signed a female geologist onto his research team in 1959, and then had to leave her behind when the Navy refused to carry her in its helicopters.

He kept trying. In 1969 the National Science Foundation opened the gates to women and Bull put together an all-female



Photo provided by Heidi Geisz

*Heidi Geisz, left, and Cindy Anderson, approach a penguin chick to band it. They are among the new generation of women researchers in Antarctica.*

research team to go to the Dry Valleys. He received a letter in response from another Antarctic explorer who wrote only one word: "Traitor."

But women have been mostly well received in the Antarctic.

"The number one point was the men behaved a sight better when there were women around. They were tidier and more polite," Bull said.

How women are treated in Antarctica often depends on the national origins of the station. When Sucher went to Vostok Station in 1995, she was the first American woman to work there.

"They were really nice," Sucher said. "They definitely respected me."

They also wouldn't let her help clean the kitchen or haul ice for water. At holidays, she had to dance with everyone, but she was also the recipient of all the gifts at Christmas and birthdays.

Julie Brigham-Grette faced another side of the Russian treatment of women when she researched in Northeast Russia in 1991. Initially, she was not allowed to sign science agreements and at one point a Russian man insisted on lugging her backpack, saying "No, I take...you carry babies."

"In such circles, respect can eventually be won by your quiet expertise with a shovel, digging arduous stratigraphic sections or by handling a small craft and outboard motor in large swells," Brigham-Grette said.

Conference co-organizer Julie Palais remembers feeling awkward and uncomfortable the first time she went to Antarctica, in 1978.

"At first I remember really hating going into the galley and having all these eyes leer at me," said Palais, who is now the glaciology program manager for the National Science Foundation. "It's so much nicer now to have a better balance and have some role models to look up to and have women who are doing good science."

Now it's rare to see a field team without a female member, Palais said.

A quick tally of the U.S. Antarctic Programs list of grantees shows that women are the primary principal investigators on 15 percent of the grants this season. That's not equality, but it's better than the national numbers. For the entire National Science Foundation, of which the Polar Programs are only a part, 12.5 percent of grants go to women. In 1999, women earned 35 percent of the doctorates in science and engineering in the U.S.

"Absolutely, there remains a reason to be concerned about the disparity in funding between female and male scientists by the NSF," said Mary Turnipseed, a second-year researcher at Palmer Station. Part of the new generation of women scientists, Turnipseed works with another woman, Lauren Rogers, at Palmer Station and did her graduate research in an all-women lab.

Anthropologist Nancy Chin is studying gender in McMurdo. She's noticed women working in the Antarctic have equal access to many of the marks of social standing.

"One of the things that gives you prestige in Antarctic society is have you been to Pole. Yes, women have been to Pole," Chin said.

In fact, the current area manager at Pole is a woman and so was her predecessor. Women have also wintered, returned to the Antarctic for many seasons and been recognized as skilled and hard workers, all additional traits people are judged by in Antarctica, Chin said. In some ways women are more equal in Antarctica than back home, Chin said. To start with, they aren't stuck with the domestic chores.

Still, men outnumber women almost 2 to 1 in the U.S. Antarctic program, Chin said.

"The balance is certainly much better than it was, but I think we can do better too," Palais said. "There should be some sort of balance that mimics the general gender balance back in the real world."



Photo by Kris Kuenning/The Antarctic Sun

MacRelay coordinator Carey Collins checks a space weather graph to assess the possible impacts for McMurdo communications.

## Solar Flares From page 1

Collins checks the space weather forecast from the Space Environment Center in Denver. A division of The National Oceanic and Atmospheric Administration, the center monitors the sun's activity and sends warnings around the world to communications operators, airlines and space programs.

Solar forecaster Bill Murtagh said the sun is currently 3.5 years past the maximum part of its 11-year cycle, but the activity of recent weeks has been significant.

The largest solar flare ever recorded in our solar system happened on November 5, McMurdo time. On the Richter scale of solar flares, it measured X28. X is the highest of the three rating categories for solar flares. Until this week, the highest rating was X20. Although smaller flares earlier in the week caused power outages and widespread auroras, this explosion was not directed squarely toward Earth, and its effects so far have been relatively minimal.

A week earlier, the same two large sunspots for the record-breaking flare were aimed directly at Earth, spitting a total of 10 solar flares at the planet. Two of

the largest of these occurred within 24 hours of each other, affecting airline flights, satellites, power stations and radio communications.

At McMurdo, the contingency plans developed since the last major period of solar activity mean scientific operations can continue with the help of Iridium satellite phones in lieu of high frequency radio communication.

The LC-130 aircraft that fly to South Pole and several field camps are also using Iridium phones to communicate. Because Iridium phones have only been used for a few years as the primary source of communication, the weather restrictions for flying without HF communication are more stringent, said Lt Colonel Paul Sheppard of the 109th New York Air National Guard.

The 150-meter cloud ceiling with 3.2 km of visibility is increased to 900 meters with 4.8 km of visibility when the HF radios are wiped out by solar storms.

## Space Weather

Just like Earth weather generates hurricanes, tornados or cyclones, Murtagh said

space weather has several distinct storm patterns. The first is a blast of electromagnetic radiation traveling the speed of light, which reaches Earth just eight minutes after the flare erupts.

"This radiation causes ionization in the ionosphere and creates HF communication problems on the sunlit side of the Earth," Murtagh said.

As quickly as 25 minutes after the initial blast, a radiation storm may begin. High-energy particles reach the outer layers of Earth's atmosphere, and wreak havoc on satellites.

"Although there is not much impact for Earth, radiation levels are increased for astronauts," Murtagh said. Because the Earth's magnetic lines feed into the north and south poles, the radiation spirals toward the poles and is absorbed into the atmosphere at levels that can be felt by high-flying aircraft.

Airlines will reroute aircraft flying at and above 9,000 meters to protect crew and passengers from a radiation dose. Murtagh estimates that flying over the poles during last week's radiation storm would have exposed crew and passenger to radiation levels equivalent to several

**See Solar Flares on page 9**

# Solar Flares From page 8

chest X-rays.

These radiation storms create a polar cap absorption in the ionosphere that can wipe out all HF signals in Antarctica for days. Two weeks ago, MacOps reported 90 hours of HF communications blackout. Last week, a series of flares on Monday morning interrupted communications for most of the next two days. Just as the signal started to reappear on Wednesday, another huge flare exploded and an hour later, the HF radio was out again, according to Collins.

The third type of storm created by a solar flare hits Earth about one to three hours after the solar flare.

Geomagnetic storms affect HF communications and cause the atmospheric polar displays known as aurora. While these displays are normally confined to regions near the polar circle, the recent solar storms created colorful light shows as far away as Florida.

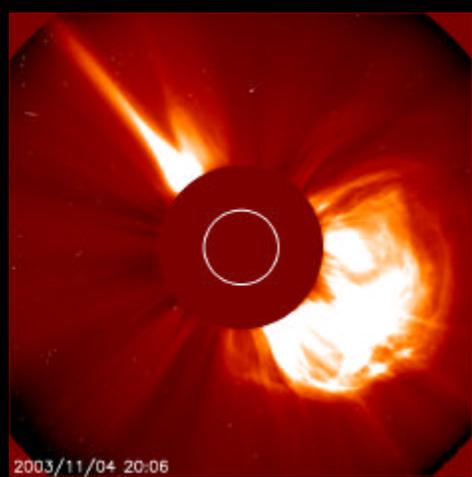
"As the sun goes through its 11-year reversal of polarities, the magnetic lines get twisted and appear as sun spots with either negative polarity or positive polarity or both," Murtagh said. "These on their own are not of great consequence but when the clusters get all mixed in together, the negative and positive areas start reacting."

Space center analysis begins with looking at sunspots, which are the visible manifest of complex magnetic structures on the sun. Forecasters know from history which of these groupings are likely to produce large solar flares. They identify size and complexity of the spots to start making their first predictions of increased activity.

These predictions give communications operators, power plants, airlines, GPS users and space program operators time to take precautionary action. Sensitive equipment on satellites is shut down. Space station astronauts retreat to the most protected areas of the craft, airlines traveling in polar regions are rerouted and deep sea drilling operations relying

**"The timing of two very large flares aimed directly at the Earth, occurring one right after another, is unprecedented."**

- John Kohl, Harvard-Smithsonian Center for Astrophysics



2003/11/04 20:06

*The largest recorded solar flare erupted on Wednesday McMurdo time, but disruptions were minor because the flare did not shoot directly towards the Earth.*

on precision GPS are put on hold. In Antarctica, communications move to Iridium phones for communication between field camps and aircraft.

While the space center can predict quite well what will happen in the days after a solar flare eruption, Murtagh said they could never have forecast the rapid development of these sunspot clusters and the intense flares they produced.

"A couple of weeks ago, we were looking at a sunspot the size of a pinhead. It was unimpressive, but then four or five days later there were two spots on the sun 20 times the size of Earth," Murtagh said.

Antarctic research is working to better understand solar phenomenon. Umran Inan from Stanford University is measuring solar effects on the mesosphere and lower ionosphere from the South Pole. At the same time, tracking lightning storms at Palmer station provides an indirect way of monitoring global weather.

Gulamabas Sivjee from Embry Riddle Aeronautical University is studying the effects of solar disturbances during the 2000-2002 solar-maximum period.

Specifically, he is looking at the heating effects of auroral electrical currents in the ionosphere by collecting data of the temperature, winds and tides of the Earth's upper atmosphere, especially above the poles.

The storms initiated by the recent solar flares were all highly ranked in the history of recordings. In addition to the largest ever flare on Nov. 5, Murtagh said two storms from the previous week produced geomagnetic storms that made the top 20 list of storms that date back to 1932.

Murtagh said this type of intensity is not unusual for periods outside the solar maximum, but the activity of the last few weeks is unusual because the flares were released within such a short time period.

John Kohl of the Harvard-Smithsonian Center for Astrophysics agrees.

"The timing of two very large flares aimed directly at the Earth, occurring one right after another, is unprecedented," said Kohl. "I have not seen anything like it in my entire career as a solar physicist. The probability of this happening is so low that it is a statistical anomaly."

## Antarctic Photo & Writing Festival

### Four photo categories:

*(One entry per category per person)*

- Scenic
- Wildlife
- People
- Other

Photos may be digital or traditional, preferably at 300 dpi

### Four writing categories

*(One entry per category per person)*

- Poetry: Up to 30 lines
- Haiku: Traditional 5-7-5 syllable poem
- Micro-fiction: Up to 300 words
- Non-fiction: Essays, letters home, e-mails, memos, journal entries, etc.; up to 300 words

*More rules: One entry per category per person for both the photo and writing contests, so choose your best. The contest is for photography and art with an Antarctic theme. This will be broadly interpreted. You do not have to be on the ice to enter. Winners will be printed in the Sun, on the Web and posted on Highway 1. E-mail staff for more info.*



**DEADLINE: 7 A.M. DEC. 14**

*Outlook users, e-mail entries to MCM-Antarctic Sun, others to antsun@polar.org, or stop by the Sun office at Building 155.*

## Marshians From page 1

their first summer season gathering samples of embryos of *Sterechinus neumayeri*, or Antarctic sea urchin, at various stages of development.

At Crary, they are isolating the DNA and RNA and charting respiration, or oxygen consumption, rates. The samples and data the team gathers will be analyzed back in the lab at Lewes, Dela.

The “Marshians” are a unique bunch, sporting funny hats in the field and “Matrix” costumes on Halloween. Kevin Fielman, a post-doc who just left McMurdo for Lewes this week, was working to relate patterns of gene expression to a particular gene. Tracy Szela, who is pursuing her master’s at Delaware

in marine biochemistry, is a team diver and studies respiration. Lindsay Kendall is going for her doctorate at Delaware and cultures the embryos, quantifying their DNA and RNA. Leonard Pace is hoping to jump from his bachelor’s degree in marine and environmental science at Hampton University to a PhD at Virginia Institute of Marine Science.

They do their lab work to the beats of MP3s streaming off an iPod in Marsh’s office. Even with the music in the background, their work is focused.

At her station near the back of the room Kendall wields a pipette and microscope with finesse, searching small samples of water and other material on a

microscope slide for urchin embryos. When she finds one she transfers it to another microscope and prepares it for future analysis, delicately drawing off water, adding buffer, fluorescing the sample to determine whether it is DNA or RNA and placing each sample in a tiny tube to take back home.

Marsh oversees the work, offers guidance and jumps in to help with the sampling and processing. The others are busy checking embryo respiration rates and logging data. Pace, an intern working with Marsh’s team and biologist Art DeVries, is studying the respiration rates of dragon fish.

Marsh is familiar with *Sterechinus neumayeri*. Back in 2001, he and colleagues Rob Maxson and Donal Manahan of the University of Southern California authored a paper in the journal “Science” which reported they had found that Antarctic sea urchins function at a much lower metabolic rate than other animals. In fact, the urchins’ metabolism is 25 times lower.

The purpose of the genome research Marsh is now conducting is to find out why that is the case and whether the animal can adapt to a change in temperatures.

That fits in well with a 2003 report called “Frontiers in Polar Biology in the Genomics Era” by the Polar Research Board, which calls for additional study of organisms such as the sea urchin to find out how they function and what affect any change in temperatures may play on their vitality, among other goals. The board receives funding from the National Science Foundation.

Marsh said his team will reach one of two conclusions: Either the animal is genetically encoded to slow its metabolic rate or it has adapted some other way. Because it’s early in the research, no data is available to suggest a conclusion one way or another, he said.

Finding out the urchin is genetically encoded to slow its metabolic rate would set a precedent and standard for other types of biological genomic research in polar regions.

“We’re putting a mechanism to it,” Marsh explained.

“We’re working on a scale of which that mechanism is almost a property and we can expect that the same kinds of organizational structures and gene expression exist in deep-sea bacteria and other organisms in other locations.”



At left, graduate student Lindsay Kendall processes a sea urchin embryo in the second stage, under a microscope before she places it in a tiny tube for transport back to the team’s lab at the University of Delaware in Lewes. The team is attempting to understand the growth mechanisms of the urchins via genetic analysis.

Below, Leonard Pace holds two live sea urchins captured in McMurdo Sound. He explained that the team keeps its sample buckets at the Crary Lab aquarium and label them “Marshian Larvae.” The aquarium keeps the specimens at a constant temperature, approximating their life in the sea. Embryos are cultured from the genetic material that is emitted along with a jelly at the top of the urchin. The sex is typed after removing the jelly and analyzing it to determine whether it contains sperm or eggs. The urchins have two types of “spines,” ones that transport it and ones that protect it.

Photos by Brien Barnett/The Antarctic Sun



## Sea urchin project extends beyond McMurdo



Photo by Brien Barnett/The Antarctic Sun

Research intern Leonard Pace shows off buckets of sea urchins. Pace is a graduate at Hampton University.

By Brien Barnett  
*Sun Staff*

Adam Marsh's project goes further than the study of sea urchins. He's added three more components to the mix.

The first is an intern program to encourage minority students interested in marine science to experience Antarctica and to follow up their experience here with graduate-level education.

Leonard Pace, who is African-American, is the program's first recruit and it suits him just fine.

"I love traveling," Pace said about his preferred career.

Fresh from a stint in Gansbaai, South Africa where he studied great white sharks, Pace is now in Antarctica studying the respiration rates of dragon fish. He obtained his undergraduate degree at Hampton University and hopes to enter a grad program this fall.

Marsh said the goal of the program is to encourage more points of view in what has traditionally been a white, male profession.

"There's an extreme shortage of minority students," Marsh said. "That's why the program's gone to great lengths to try and actively recruit minorities into the field."

Marsh is hoping for two interns each of the next two years of his project.

Also, Marsh and his colleagues at the University of Delaware hope to use the project to spur development of a "bioinformatics" program there. The goal of the program would be to teach environmental science students about the structured patterns of genomic studies.

"Bioinformatics is [the process of] trying to bring information to bear on specific research projects," Marsh explained.

Last, the project is working toward interacting with school kids next year. Marsh is unofficially adopting his children's hometown school, Lewes (Dela.) Elementary, but hopes to get more schools interested in following his project and to offer teaching resources for instructors.

## Antarctic rocks make it out of the piles into the files

By Kristan Hutchison  
*Sun staff*

Geologists looking for Antarctic rocks can now skip the long trip south, and find them in Ohio instead.

The new United States Polar Rock Repository, dedicated Oct. 11, already contains 1,500 rocks collected all over Antarctica and the Arctic.

There is room on the shelves for 80,000 more, and then the movable shelving can be rearranged to double the capacity, said curator Anne Grunow.

"The goal of the repository is for people to use this as a data source," Grunow said, "for people to come here and try to get some information about where they want to go and what they might find before they actually submit a proposal."

The repository was primarily paid for by the National Science Foundation and is built adjacent to the Byrd Polar Research Center at Ohio State University. About 60

people attended the dedication, held outside on a warm, sunny fall day, Grunow said. Scott Borg, head of the NSF Antarctic sciences section, cut the ribbon at the dedication.

"I'm delighted that Ohio State took the initiative to develop this repository and there is every reason to believe that it will be well used," Borg said. "Repositories for hard-to-get material, such as ocean-floor sediments and rocks from Antarctica and the Arctic, prove themselves useful as others dig into samples and find new things about Earth history."

The rock samples include those collected by Cam Craddock, one of the early geologists to bring back Antarctic samples. Grunow's assistant, Sue Rose, has been going through his field notes, which were taken before most of the locations in Antarctica were named, and trying to label the rocks with new locality names.

"These collections from a long time

ago take a little more time to be catalogued," Grunow said.

But they are worth the time because some of the rock comes from places difficult to return to, either because they are so remote, or because they are now a specially protected area.

About 20 other geologists have donated rock, ranging from the size of a half dollar to a boulder weighing more than 27 kg, plus field notes, microscope thin sections, photographs and maps.

"We've almost every kind of rock represented based on the collections that have been or are being given to us and they are from many different regions in Antarctica," Grunow said.

In a few weeks, descriptions and digital images of the rocks collected by Craddock will be listed online, so researchers can browse the stacks without entering the building.

# Profile

## Solar Joe follows the sun

By Kristan Hutchison/*Sun staff*

When Joe Yarkin left for work in late September, the blackberries were ripe on his farm in the Puget Sound. The berries will be long gone by the time he returns from Antarctica in February and his younger daughter, Eleanor, might be walking. He'll be home just in time for her first birthday on March 4.

"His going down to Antarctica is a mixed thing," said Joe's wife, Celina Yarkin. "For the most part, it works really well for us."

Commuting dads are common on Vashon Island where they live, just a 25-minute ferry ride from Seattle. But Celina thinks it would be harder to have Joe gone from 9 to 5 every day than it is to have him leave for five months. When he's at McMurdo Station they talk by phone twice a week, still sharing the daily events.

"I mourn for about a week, and after that it's fine," she said. The positive side is when he's home from work, he's home full time for seven months.

"It's so fun having summers off," Joe said, holding Eleanor as he walked barefoot through the grass.

He's spent much of his time off building a 158 sq. meter house on their 5-acre farm, with help from Antarctic friends. By building it himself, he's avoided needing a loan.

"He's a pretty easy going guy with an easy sense of humor," said Chuck McClellan, who helped frame Joe's house during the northern summer. "We'd go sit on the lawn every day for lunch and Adriana (Joe's daughter) would come and feed me fennel, even if I didn't want it."

Until the house is ready, the family of four lives in a 12 meter by 2.2 meter shipping container, the kind that was once refrigerated. Yarkin got the idea from seeing the many uses of shipping containers in Antarctica and the way field camps are set up. Last season he gave a presentation on container houses at McMurdo Station.

He's added a door, window, built-in furniture, running water and electricity. A solar panel runs their water treatment system and they use a composting toilet.

"This is the advantage to having the solar guy," Celina said.

At McMurdo Station, "Solar Joe," as he is sometimes called, sets up renewable energy systems for field camps and stations, using a combination of wind and solar power. He took the job six years ago, after being a solar contractor in New Mexico.

"The interest in the solar industry has been there for a long time and he's worked in different aspects of it," said Joe's uncle,



Photo Kristan Hutchison/The Antarctic Sun

*Joe Yarkin at home with his family a few weeks before leaving for his five-month job in Antarctica. Yarkin holds his daughter, Eleanor, while his wife Celina mixes shortcake.*

Hugh Binley, who started working in Antarctica last season after being enticed by Joe's stories. During the off-season Joe also created two portable solar power systems for Antarctic field camps, using the shell of his house as a workshop. He designed the 115-kilogram units to fit inside a helicopter.

"They're transportable by all the Antarctic methods," Joe said. "You can just pop it out of the plane and snap it together."

The house he's building is designed to be passive solar, gathering and storing heat during the day to keep it warm at night. He's also using the sun to heat their water, but he's relying on a wind generator and standard power lines for electricity.

Celina designed the house. She met Joe 12 years ago when they were students at Antioch College in Springfield, Ohio. He was an experienced train-hopper and Celina convinced him to take her along. Then she accidentally stepped on the airbrakes and stopped the entire train. They had to jump off and hide while the engineers searched the cars. The incident didn't put the brakes on their relationship. The couple moved to Vashon three years ago, about the same time their first daughter, Adriana, was born.

"She always changes when you go

away," said Joe, who admits it's become harder to leave now that he's a dad.

Adriana knows where Antarctica is and tells her dad she wants to go there someday, so she can eat all the ice. But when a stranger asks questions she responds by baaa-ing like a goat.

Goat is apparently second language for the tow-headed child, growing up with four goats, a dog and a small flock of chickens. The Yarkin's are training their goats as pack animals, taking them and the kids on small camping trips to the Olympic Mountains or smaller parks on Vashon Island. Eventually Yarkin hopes to run a small guiding business, leading mountain trips with a herd of six goats to carry the burdens.

"As pack animals, goats are really good," Joe said. "They have very little impact on the trail."

Before he left for work, Joe butchered chickens for the winter and helped preserve some of the apples, corn, squash and beans they grow.

He misses his family, and the sun-ripened blackberries, but he's glad to be at work.

"I just haven't wanted to let go of the Antarctic thing yet," Joe said.