The Antarctic Sun

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

December 14, 2003

Underwater world...

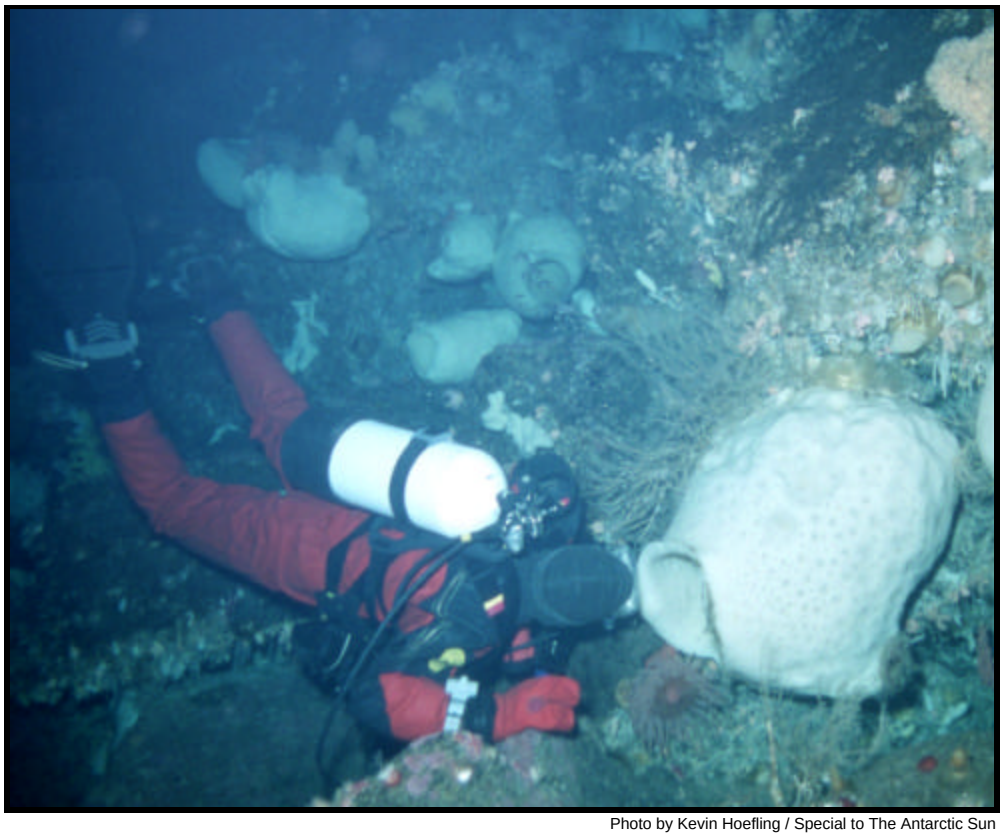

Photo by Kevin Hoefling / Special to The Antarctic Sun

Antarctic diver Luke Hunt peeks inside a sea sponge near Cape Barne in McMurdo Sound.

The other side of the Ice

By Kristan Hutchison
Sun staff

Antarctica becomes a different world from below, full of color and life, where the penguins actually seem to fly.

It's a side of the Ice seen only with 60 kg of scuba gear and enough insulating layers to make the Michelin man look underdressed. Despite the cold and difficulties, science divers return to the surface eager to go below again, with descriptions and pictures difficult for those standing on the empty icescape above to imagine.

"That's the cool thing about diving here," said Rob Robbins, dive supervisor for the Antarctic program. "There's basically noth-

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Scientists get ANTCI

By Kris Kuenning
Sun Staff

Greenhouse gases and global warming. The ozone hole. Sunburn and glacial melt. These things affect the whole world. So why study them in the frozen desert at the bottom of the earth?

"As the climate changes, so changes the chemical composition of the atmosphere," said atmospheric chemist Douglas Davis from the Georgia Institute of Technology. "And that chemical composition becomes a fingerprint of the climate imprinted on the ice."

The ice blanket over Antarctica provides half a million years of fingerprints. But to analyze the chemicals in an ice core sample, scientists have to understand where they come from and how they are converted to the forms found in the ice.

A project involving 10 institutions, led by Fred Eisele, started by investigating the Antarctic processes related to sulfur. Eisele holds a joint position at Georgia Tech and the National Center for Atmospheric Research.

Sulfur is important in the atmosphere because it reflects solar radiation, produces atmospheric haze and acid rain and influences ozone depletion. Sulfur is produced naturally by volcanoes and the ocean's phytoplankton, but it also is a by-product of certain industries.

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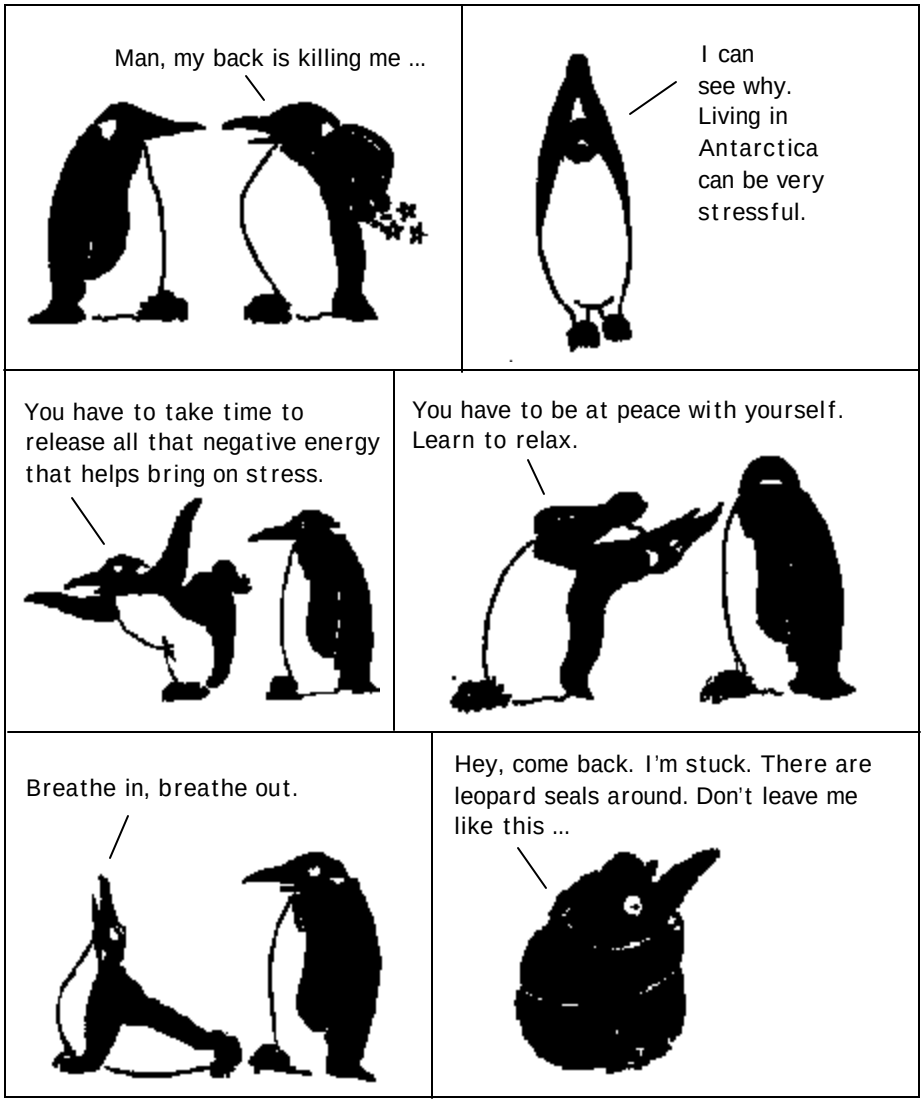
INSIDE

Quote of the Week

"You don't get where I am by quitting at the first sign of a headache."

- Private pilot short of fuel at McMurdo Station

Ross Island Chronicles By Chico



Cold, hard facts

McMurdo's network

Amount of bandwidth available for Internet users: 768 kb, similar to a DSL line back in the States, but for 1,000-plus users. About 50 percent of that is for recreational Web surfing. The pipe is capable of sending data at 5.7 MB of data per minute. In a 24-hour period, the average is 5.5 MB per minute.

Data receiving priority if needed:
1. Emergency medical video teleconferencing (rarely used, but up to half of all bandwidth dedicated to it when needed)
2. Grantee data, internal network infrastructure traffic and International Monitoring System data
3. Grantee data, NPR streaming audio feed and mission critical infrastructure traffic
4. Grantee data, Outlook e-mail, weather data
5. Grantee data and Web traffic (surfing)
Blocked: All other streaming media, Peer-to-Peer file sharing clients.

E-mail messages per:
Week: 102,083
Day: 14,583
Minute: 16

Best times to use the Internet: Late night, between 1 to 4 a.m.

Source: McMurdo Network Operations Center

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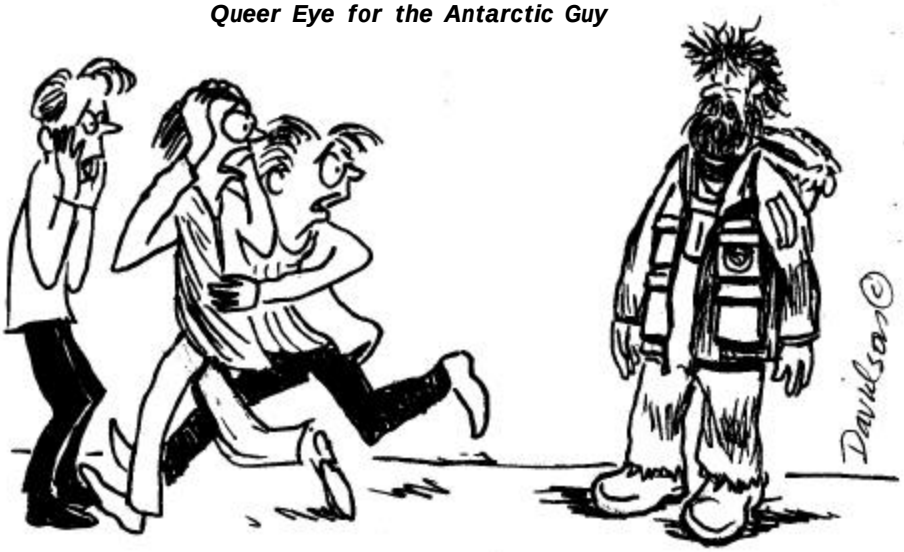
Matt Davidson

Queer Eye for the Antarctic Guy



"Oh my god!!! What is that? Run!!!"

Documentary crew visits South Pole

By Kristan Hutchison
Sun staff

After 11 days, National Geographic documentary producer, Michael Brown knows more people at the South Pole than in the town where he lives. He talked to at least 100 people at Amundsen-Scott South Pole Station, almost half the station population.

"In the end, it was a lot of people and pretty intense things, because there, things are pretty much stripped down to the bare necessities," Brown said of his first visit to the Pole.

He expects to return next year with footage to show, since this is just the beginning of a three-year film documentary National Geographic is making, with support from the National Science Foundation. Brown is working with associate producer/sound engineer Adrian Kubala and cameraman Mike Single. This was Single's 19th trip to Antarctica.

The purpose is "to show the public the value of South Pole Station, which as it turns out is pretty amazing," Brown said.

Having climbed Everest three times, Brown isn't easy to impress, but the science and people at the South Pole left a strong impression on him. So strong, in fact, that he's considering coming back for a winter someday.

"It's one of the last places where this number of people can be right on the edge of the frontier," Brown said.

His first clue that South Pole would be a different experience was when he got off the plane and saw the cargo handlers dancing to keep warm.

"Things are interesting, but the most visually intriguing thing there is is a human face," Brown said. "The expected is not that interesting, but the unexpected or fun stuff is much better."

To capture those unexpected moments, the camera crew spent time following people around as they worked and interacted with other people.

Photo by Paddy Douglas / Special to The Antarctic Sun

Adrian Kubala holds the documentary team's fuzzy shotgun microphone, while cameraman Mike Single captures video and Michael Brown directs from the skiway at South Pole.

"Our story, the way we tell it, is through people. We won't try to talk down to anybody through this film."
-- Michael Brown, National Geographic producer

"Our story, the way we tell it, is through people. We won't try to talk down to anybody through this film," Brown said.

The science projects he focused on during this visit were ones with scientists at the station to talk about them, including the 7 km long antenna, atmospheric physics, the ozone hole, climate change, solar flares and the upcoming project to build a large neutrino detector.

"I was very intrigued at how important the science is to the rest of the world," Brown said. "This is not just studying for studying's sake. This is stuff that matters."

The documentary crew also filmed the logistics of the station, from a tour through the old dome with station manager BK Grant to the construction crew yelling to keep each other psyched up as they mounted steel beams in place in –40 C.

"We got sort of broad brush strokes in this first visit," Brown said. "The parts of the story we really like, we'll come back and complete them."

Some of the stories he'll complete back in the U.S., where he plans to film air samples from the South Pole being analyzed at the lab in Boulder, neutrino detector parts being packed for shipping and the supply vessel being loaded in Port Hueneme.

He hopes to follow it up at McMurdo Station, filming the arrival and unloading of the supply vessel.

"Without McMurdo, there wouldn't be much of a South Pole station," Brown said.

Continental Drift

What is the oddest job you've ever had?

"I mixed chemicals at a button factory."
Cara Sucher, Palmer senior assistant supervisor of lab operations, Port Washington, N.Y., sixth season

"Being a carnie for a year. I traveled all over Oregon, Washington and British Columbia. It was great."
Mark Furnish, McMurdo waste ops manager, Denver, 10th season

"Valet at International House of Pancakes for senior citizens' night."
Nicholas Johnson, South Pole cargo, Seattle, fifth season

Perspectives

Finding your strength in Mactown

By Mariah Crossland

Of all the ways to spend free time in Antarctica, only a few of them will add muscle, build stronger bones, lower cholesterol and increase a person's metabolic rate while relieving stress. Weight lifting may do all this and more, which is why quite a few United States Antarctic Program participants hit the heavy metal regularly.

McMurdo's weight room shares Quonset hut 63 with the bowling alley, bouldering cave and crafts rooms. Building 63 is one of the oldest buildings left in town. It's not a modern chrome and glass, temperature controlled gym bright with natural light. There are no potted ferns, juice bars, or personal trainers in tight shorts, no meditative environmental Muzak piped through the building and you can't watch TV.

At our gym the fluorescent lights are harsh and the dingy room is either freezing or way too hot. A stereo in the corner usually crashes out head banger CDs. Whether you call that music or not, it's easier to lift to than the sound of your own grunting. The closest thing we have to a jacuzzi is when the weather warms up and a winter's worth of spindrift drips through the ceiling into puddles on the floor. But hey, it's open 24/7, it's free, and everything necessary for a high tech strength program is readily available here; barbells, dumbbells, plates, racks, benches, collars, mats, cables and machines. Weights, weights and more weights.

The gym may seem intimidating to a new person, but inside it's a friendly place with camaraderie among the lifters. If you don't know where to find an apparatus or how to use it, usually someone is willing to show you. It's rarely crowded and the wide range of equipment available should keep you from having to wait around to finish your routine. While it may seem as if everyone in there has been lifting for years, many people are new to the sport. Beginners are welcome but proper technique is important both for safety and for getting results. For a tour of the weight room or to learn the basics, ask the folks at Recreation for an introductory visit.

Photo by Kris Kuenning / The Antarctic Sun

Joe Harrigan, a network operations specialist at McMurdo Station, demonstrates the bench press in the weight room. The workout area offers a range of free weights and equipment to stay in shape. Be sure to bring some music

Most athletes benefit from lifting weights. On any given day you might find bike racers doing heavy squats, rock jocks performing one armed pull-ups or skiers bench pressing for upper body strength. Maybe you're not that spry, or have a stiff knee or sore lower back?

A gentle lifting program can rehab that tired body. For women at risk of osteoporosis, weight-bearing exercise is highly recommended. Eric Rivera from the New York Air National Guard says the military personnel on station can use up to three hours a week of their shift time to stay fit in the gym. Gym time is on a volunteer basis for McMurdo's firefighters but is strongly encouraged.

Doctors and physical therapists, mechanics and computer geeks, general assistants and station managers frequent the facility which makes it seem like a pretty healthy and hip place to hang. If you're looking for a challenge, check into weightlifting, and if you're already lifting, check out McMurdo's 3rd Annual Powerlifting Competition to be held Feb. 1.

around the continent

SOUTH POLE

When the workday's done

By Peter Rejcek
South Pole correspondent

Polies work hard — at least six days a week, nine hours a day. Some folks work even more hours. It follows that there's a need to play hard at the South Pole as well.

From pool tournaments to yoga to a film festival to tae kwon do classes, recreation takes on a variety of forms at this frozen frontier.

Photo by Peter Rejcek / Special to The Antarctic Sun

Brooke Berens practices a kick in the gym. She teaches tae kwon do at the Pole.

"Things are going on all the time," said Ruth Ofstedal, South Pole Station Support supervisor, whose duties include overseeing and nurturing the recreation program here. Much of the day-to-day operation falls to Mary Baker, South Pole Retail coordinator.

Baker, sitting at her office desk last week opening e-mail, says she is constantly receiving requests and ideas for new activities.

"Somebody wants to have a sleigh ride," she exclaimed while sifting through electronic messages. "That would be a blast."

Many activities live or die depending on the dedication of volunteers. And while many events are sanctioned by the recreation department, others are carried out independently, such as ping pong and basketball, according to Ofstedal.

"Recreation is from the community and planned," she said.

Brooke Berens, the tae kwon do instructor, said she always had plans to offer classes at the Pole, even from her first job interview.

"I love teaching," said the third-degree black belt. "It's a good way for me to structure my own training."

Berens works as a general assistant. A resident of Boston, she still tries to return to Cleveland every year to her old school, the Oriental Martial Arts College. She's been doing tae kwon do for 17 years.

"I like the physical training, the mental training (of tae kwon do)," she said. "I'm having a great time … I can see people improving, even after a few weeks."

Baker noted that many activities are exercise-related — one of the more popular pastimes is cross-country skiing — but there are offerings that also tickle the brain, as well.

Vincent Scott in Comms, with a background in theater, offers weekly Shakespeare readings on Sundays. He's also attempting to organize a play reading of *Terra Nova*, a drama about Robert Scott's ill-fated attempt to be the first to reach the South Pole.

Also in the works is the first annual South Pole Film Festival, which is already generating a lot of buzz, Ofstedal said.

The festival is the brain child of Brian Land, a carpenter in his fifth season.

"I've had the idea for organizing a film fest in previous years, but it's coming together this year for no other reason than I finally decided to do it," Land said.

Compared to McMurdo, Pole has lacked a real arts scene, he added.

"All I wanted was to make a movie, have a bunch of other people make movies, then get together … and make a festival out of it," Land explained. "Now, thinking more about it, I guess I'd like to see it become something people do year after year."

The film festival, if successful, could join the pantheon of other annual events such as the Race Around the World, Pole's yearly homage to track and field, with a few unique twists.

Of course there are the annual parties, as well. This Saturday is the much-anticipated retro disco party, normally held around Thanksgiving, Ofstedal said. Slated to begin at 9:30 p.m. at the non-smoking Summer Camp lounge, the party will feature a disco ball and really bad clothes.

"That was a really big event that went over very well last year," she said.

It's probably impossible to compile an exhaustive list of South Pole activities. There's still bingo, with hundreds of dollars in prizes available, the Sky Lab music room, and lots of DVDs and videos to watch. And there are new offerings always being created, such as last week's first Spanish class meeting.

"People are talking about getting together a running club," Ofstedal added.

So while Pole doesn't have the facilities or population to match her big sister on the coast, residents here can still find plenty to do.

"It's so different from McMurdo," Ofstedal said. "Here we have to make our own fun."

Photo by Cara Sucher / Special to The Antarctic Sun

The tourist cruise ship, Clipper Adventurer, *arrives at Palmer Station.*

PALMER

Ships, tourists arrive

By Kerry Kells
Palmer correspondent

Crowded into one week, we have had tours of station for new arrivals, returning science researchers and even Antarctic tourists.

On Sunday, Monday and Tuesday the *Laurence M. Gould* tied up to our pier. Those scientists on the cruise, new scientists arriving to station, ship crew, marine personnel and even Raytheon's area

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the week in weather

McMurdo Station
High: 41 F / 5 C Low: 23 F / -5 C
Wind: 24 mph / 39 kph
Windchill: -6 F / -21 C

Palmer Station
High: 39 F / 4 C Low: 23 F / -5 C
Wind: 17 mph / 28 kph
Windchill: 14 F / -10 C

South Pole Station
High:-7 F / -22 C Low:-23 F / -31 C
Wind: 29 mph / 47 kph
Avg. physio altitude: 10,182 feet

Palmer From page 5

director, Bob Farrell, arrived at Palmer Station.

Having just finished our Thanksgiving holiday, we rushed to greet the *Gould* to station and help unload the cargo. Marine personnel, ship crew, scientists going to Vega Island and to Seymour Island and new scientists wandered about station. The put-in of field camps at Vega and Seymour islands was delayed due to heavy pack ice surrounding both islands. So the *Gould* came over to Palmer Station instead to drop off new community members and to take away a children's author, one of the krill divers and Joe Pettit, station manager. The ship then dropped off the scientists at Vega and James Ross islands.

On Thursday, we greeted the *Clipper Adventurer*, a mid-sized cruise ship bringing to Palmer Station our first tourists of the season. The ship arrived in Arthur Harbor with a view of Piedmont Glacier.

The first tourists arrived on station at 9:30 a.m. and the tours began. Led through the station on a guided tour, they stopped at the "tourist aquarium" to view and ask about the sea spiders, starfish, sea anemones and other creatures in the tanks.

The tour continued past the sauna, general warehouse and recreation building and over to the station store, back down the road past the fuel tanks and then down to the dining facility for coffee and brownies. Tour guides explain the history of Palmer Station, science studies and wildlife in the area, the proper names of the surrounding sites and glaciers and even the support jobs on station. Tourists are interested in the different roles we perform at Palmer beyond our jobs such as fire team, ocean search and rescue and glacier search and rescue.

Beyond the many questions on the weather, the wildlife and the workday, sometimes our visitors ask more unusual questions. Why is a pirate flag outside the Birder Hut? What do you do for intellectual stimulation on station? Tour guides even get questions about the comparisons of human waste amounts to that of the guano of the penguins on Torgersen Island.

About 60 of the tourists were with the American Association for the Advancement of Science and many were academicians from several U.S. universities. Among those visiting were retired and current professionals from many fields, including a national Centers for Disease Control epidemiologist, who met with our doctor.

One hundred fifteen tourists visited Palmer Station on that day. Although it was a busy week for us at Palmer Station, the arrival of both research and cruise ships brought new energy to station. The *Gould* introduces new faces to Palmer Station along with "freshies" and package mail.

Photo by Cara Sucher / Special to The Antarctic Sun

Visitors from the Clipper Adventurer *tour Palmer Station.*

The cruise ships allow us the chance to talk to visitors and to educate the public about Antarctica and the National Science Foundation. All visits to Palmer Station increase awareness about Antarctica and reinforce the need to preserve the continent for science.

SHIPS

Laurence M. Gould

Compiled from reports
by Harold "Skip" Owen.

After dropping off a field party at Seymour Island the day before, The Laurence M. Gould arrived in the Elephant Island work area on Dec. 6, where the crew carried out experiments with Richard Viet of the City University of New York. Viet is studying how Antarctic seabirds respond to changes in the abundance and distribution of their Antarctic krill. From the ship, researchers are casting nets and carrying out six 50 km long bio-acoustic surveys. All systems were working well. Good weather and calm seas meant the work was progressing well early in the week. The weather was not cooperating as well for some of the field camps. The Gould received reports from Seymour and Vega Island groups that recent snow had hampered their efforts, but all was well.

Icebreakers on the way

By LCDR April Brown, USCG

The Coast Guard's two Polar Class icebreakers will work in concert this season to break a channel into McMurdo and escort the resupply vessels to the ice pier. Polar Star is scheduled to arrive at the McMurdo ice edge about Dec. 23, and the Polar Sea about New Year's Day. The Polar Star is in Hobart, Tasmania and the Polar Sea is in Sydney.

Also, the tanker Gianella will arrive about Jan. 15, to act as a floating gas station for two very thirsty icebreakers. The cargo ship American Tern is due at the ice edge Feb. 1.

Orcas are gathering at the ice edge now, about 25 km out. For updates, check the public folders under "aircraft and ship operations," and on the "corkboard," and remember the mantra "Semper Gumby" ("Always Flexible").

ELSEWHERE

Pilot lands at McMurdo

National Science Foundation

A private pilot who landed at the main U.S. research station in Antarctica without sufficient fuel to continue his flight to South America has received enough fuel to get to New Zealand from another adventurer who has canceled her flight.

Jon Johanson, an Australian citizen, was attempting to fly from New Zealand to South America over the South Pole when he returned to McMurdo Station Dec. 8. Strong head winds and low fuel forced him to abandon his intended destination. Upon arriving at McMurdo, he told U.S. officials that he did not have enough fuel to continue and requested to buy some.

Officials at McMurdo Station and New Zealand's Scott Base were not informed of the flight and Johanson had not made prior contingency arrangements. Fuel of the type required for Johansen's plane was not available from regular stocks.

NSF's policy is that private expeditions should carry sufficient insurance to cover the costs of search and rescue efforts, if needed.

U.S. National Science Foundation representatives and their New Zealand counterparts had offered Johansen and his plane passage back to New Zealand at his cost.

However, British aviator Polly Vacher had shipped some of the required fuel to Scott Base for a trans-Antarctica charity flight that had been planned for some time. Vacher agreed to transfer the fuel to Johansen after she canceled her flight from Britain's Rothera station because of bad weather and fuel supply problems.

For more information, see http://www.nsf.gov/od/lpa/news/media/

Koreans capsize, rescued

Reuters

SEOUL, South Korea — Seven South Korean scientists and would-be rescuers were rescued in Antarctica after their boats capsized near the country's polar research station, according to Reuters news agency. An eighth person, a scientist, died. It was not immediately clear how he died. Antarctic research teams from around the world joined the rescue effort for the eight South Koreans aboard the two boats that overturned in bitter weather at the weekend.

Underwater

From page 1

Photo by Dan Martin / Special to The Antarctic Sun

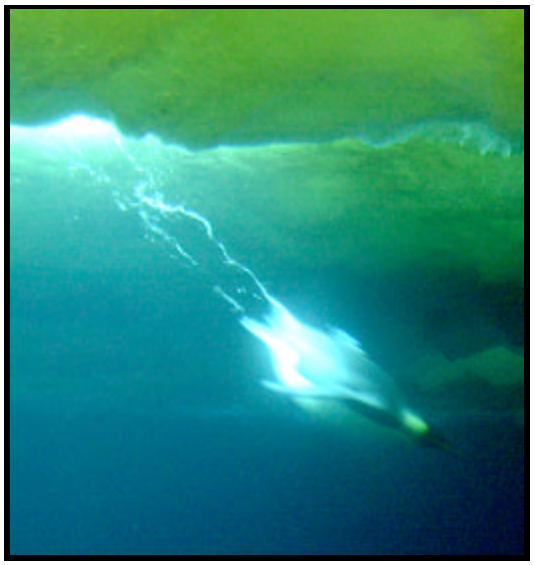

Photo by Kris Kuenning / The Antarctic Sun

Above: Penguins transform from awkward waddlers to graceful, soaring birds when they dive below the ice as seen from the observation tube at the Penguin Ranch.

Left: A sea star on the ocean floor near Palmer Station.

ing going on above the ice, and below it's a really rich community."

Divers collect samples of marine plants and creatures for the scientists and tend experiments set out along the bottom.

The heavy sea ice in McMurdo Sound acts like a layer of clouds, putting the under ice world in a deep twilight even while there is constant sun above. Divers drop in through holes around 2 meters thick, like ice tunnels, then pause to let their eyes adjust.

"If you've ever been walking in the woods in deep twilight you know what that's like. It's a little spooky," said Peter Brueggeman, who did 49 dives under the ice assisting underwater photographer Norbert Wu several years ago.

Without lights, the watery scene is dim gray and dark blue, with a beam of light shooting from the dive hole all the way to the sea floor. The divers carry flashlights to illuminate the hidden colors – bright reds, yellows and oranges.

The first impression most divers have when they go below is the incredible clarity of the water. In other parts of the world, being able to see 9 to 15 meters is a clear day underwater. In Antarctica, the water can seem as clear as air, with views easily 60 to 90 meters or more around McMurdo Sound. It can feel like flying, said Mike Lang, Antarctic program diving safety officer.

"What comes with that is an underestimation of depth and distance," Lang said.

Brueggeman recalls looking up as he dove beside a grounded iceberg off Cape Barnes. He was 25 meters down and could see the ice ceiling, like a flat, deep blue sky stretching away and fading to black. To his side the blue wall of the iceberg stretched to the surface, like the hull of a huge ship.

"You just usually don't get that kind of perspective underwater, that you're in this huge space," Brueggeman said. "There, you can see as far as there's light pretty much."

"It's the ice that makes it so different," Brueggeman said.

For Brueggeman the most exciting icescape was at Couloir Cliffs at Granite Harbor, where an icefall extends underwater, with stalagtites of ice hanging down to create a sparkling underwater ice wonderland. Even the plain sea ice is more interesting from underneath, where it is not flat, but curved and mounded "like this dark and stormy sky at night," Brueggeman said.

Where the ice is thin it seems to sparkle and at the edges of icebergs it becomes jagged.

But these ice clouds are also pastures. Greenish brown algae and plankton cling to the underside, with fish and other animals grazing through them. Sometimes bubbles from the divers respirators float up and bump into the algae, prompting a shower of brownish gunk, Brueggeman said.

Between the ice and the seafloor there is nothing but jellyfish and an occasional passing penguin or seal. In other parts of the world divers share the water column with fish, but in Antarctica the fish stay near the top or the bottom.

"Mostly it's empty looking. You drop down and there's nobody there," Brueggeman said.

On the seafloor divers find pockets of activity, like submarine cities. The first 9

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Underwater From page 7

meters from shore are generally scoured of life, because anchor ice forms there and rips up anything that tries to grow, Robbins said.

From 9 to 14 meters, reddish sea stars sometimes blanket the floor, devouring anything in their path. The starfish work in gangs, expelling their stomachs onto their prey and digesting. Then the starfish pull their stomachs in and move on, leaving pockmarks in what's left of the meal.

"If you were a diver and you laid still for a while, they'd crawl over you and start eating you," Brueggeman said. "They're ruthless, they're frightening once you realize what they're doing."

Nothing is wasted in the underwater ecosystem. Anything edible gets eaten, even the Weddell seal feces.

"It's sort of like McMurdo Station, heavy duty recycling. Very efficient," Brueggeman said.

Deeper down the creatures seem magnified. Diver Lang said the cold water depresses their metabolism, allowing creatures to live longer and need less food than in a warm water system.

A sea spider that would be the size of a fingernail in California is as big as two hands put together. Worms grow to six feet long, lying on the seafloor protected by a highly acidic mucus. At 30 meters and below, white volcano sponges grow as tall as a person.

"It just seems like the deeper you go, the cooler it gets," Robbins said.

The dive limit is 40 meters, but remote operating vehicles have brought up photos and samples from 90 to 120 meters deep. Divers sometimes find creatures in the shallower areas that normally only live in the deep ocean, because the dark and cold mimic deep sea conditions, minus the extreme pressure.

"There are things down there we don't know," Robbins said.

Giant Antarctic isopods, crustaceans as big as a man's hand, move languidly along "like a little armored vehicle moving along the bottom," Brueggeman said.

Animals interact, hunt each other, eat, but all so slowly it's almost imperceptible.

"On our time scale, nothing's moving down there. The fish sit around," Brueggeman said. "Everything's moving on a different timescale, like starfish time."

So it caught Brueggeman by surprise when a palm-sized bernacchii fish darted from the bottom and bit him on his upper lip, the only part of a diver exposed underwater. It probably looked to the fish like the raw skin on a Weddell seal wound, at which the fish frequently nibble. The fish's serrated jaw left a fierce pain, but the cold water quickly numbed it, Brueggeman said.

His other wildlife experiences have been friendlier. Sometimes the Weddell seals swim near by underwater, and once a seal pup approached him.

"The baby came up and nuzzled me on my forehead and was playing with the bubbles from my regulator," said Brueggeman. He kept his hands by his side, hoping the large mother seal nearby would not think he was a threat.

In the water, the seals seem like a different animal from the clumsy blobs that lay lazily on the sea ice above. Weddell seals swim swiftly amd can turn on a dime.

Diver Dan Martin's most memorable encounters with seals are aural, rather than visual. A couple times a season he'll hear the seals underwater.

Photo by Dan Martin / Special to the Antarctic Sun

Leopard seal checks out a diver near Palmer Station

"They don't run from you, but they certainly don't come up and nuzzle with you either"

-Peter Brueggeman, diver

On one murky dive the seal went through an entire repertory of eerie sounds, from high-pitched pings and chirps to drawn out notes descending through the scales and a deep rumbling Martin could feel through his drysuit.

"They sound like something you dream up on a synthesizer, very alien sounding," Martin said.

The Adelie and emperor penguins dart around underwater, as swift and smooth below the ice as they are slow and awkward above.

"They look like they're flying," Robbins said. "They pretty much look like little jet aircraft, with a stream of bubbles behind them."

Usually the seals and penguins just ignore divers underwater. For the penguins, a large creature underwater could easily be a predator.

"They don't run from you, but they certainly don't come up and nuzzle with you either," Brueggeman said. "Nature goes about its business."

Submerged Palmer

At Palmer Station the diving varies more with the seasonal changes through the year. The water is generally a degree or two warmer than near Ross Island, and in the summer it's almost like diving around the northwest coast of the United States. In the early season there is ice cover like McMurdo Sound, creating ethereal formations. The water is clear enough for divers to see up to 30 meters in the spring, but as the sea ice melts and the plankton bloom, the visibility drops.

"Diving down in Palmer is a lot like temperate water diving," Martin said. "There are just amazing life forms there."

The intertidal areas are scrubbed of life by the grinding sea ice, so divers look for vertical walls protected from the ice, ideally below 40 meters.

Under the ice, the algae make a bushy layer 15 centimeters thick. In the shallow areas seaweed forests grow 3 to 4 meters tall. Deeper, at about 40 meters, there are soft corals, sponges, sea stars, limpets, sea cucumbers and free-swimming pelagics. They come in purples and pinks. Martin has seen sea stars the size of a platter or a large pizza and brachiopods, ancient animals that looks like clams.

"It's something I've never seen diving in any other ocean," Martin said.

Working with scientist Bill Baker, the divers often bring up samples of sea creatures they've never seen before.

"They collect samples and send them to experts all around the world," Martin said.

Pteropods are the most remarkable, Martin said.

"They're so cool to look at underwater. One of our techs called them 'the most improbable creatures,'" Martin said.

In tropical areas divers can go under four times a day, but everything takes longer in the Antarctic.

See Underwater on page 9

A sea star rests on the floor of the Southern Ocean off the Antarctic Peninsula.

Photo by Dan Martin / Special to the Antarctic Sun

Underwater

From page 8

"It's an all day thing to do two dives, with all the gear and logistics and everything," Brueggerman said.

First the divers have to get out to the dive sites. At McMurdo they can just drive across the sea ice to a dive hut over a hole. The diving season ends in mid-December when the sea ice becomes unsafe. At Palmer Station the divers go almost year round, but often have to boat or even walk to their dive sites carrying 60 kg of gear. Volunteers help the divers get in and out of the water and their scuba gear, and keep watch for changing conditions. Then there's the cold. Water temperatures range from –2 to 2 C. With a drysuit, hood, gloves and mask insulating most of the divers body, only the diver's upper lip is exposed to the shock of the freezing water.

"It sort of feels like a shot of novocaine from a dentist," Lang said. "That happens in the first two minutes."

In shallow water the cold becomes the limiting factor. Dives usually last 30 to 40 minutes, Robbins said. At Palmer, where the temperature gets up to 2 C, Martin has been able to dive up to 60 minutes, but what usually drives him to the surface are cold hands.

Modern gear makes it easier than in the early days. When routine science diving started around McMurdo Station in the 1960s, divers went down in wetsuits. Some ended up with permanent nerve damage to their hands, Brueggeman said.Now diving is much warmer and safer. A hyperbaric chamber was installed at McMurdo Station in 1984. To treat people for the effects of sudden pressure change, nine people have been treated in it since then, half of them aviators rather than divers, Robbins said.

Most people who come to Antarctica will never get below the ice, but they can see some of the sea creatures in aquariums at McMurdo and Palmer stations. Brueggeman created a Web site on diving under Antarctic ice, which includes an underwater field guide to the plants and animals of the Ross Sea. Norbert Wu's video, *Under Antarctic Ice*, is usually shown at McMurdo Station once a season. Shot in high-definition video, the film makes the underwater scenery look brighter than it usually appears to divers. Wu's book by the same name is due to be published next year.

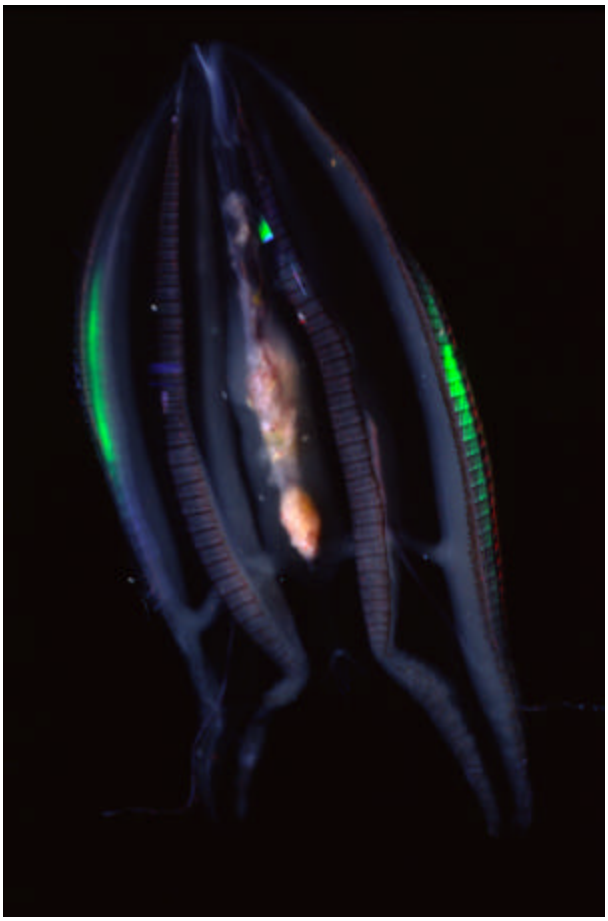

Photo by Dan Martin / Special to The Antarctic Sun

A ctenophore, commonly known as a comb jelly, has an almost spaceship appearance as it swims by.

ANTCI

From page 1

Starting its Antarctic investigations at Palmer Station in 1994, the team brought a sophisticated array of sulfur measuring instruments to the Antarctic Peninsula.

The investigators wanted to see how the sulfur released from the Southern Ocean would be transformed and broken down (or oxidized) by the atmosphere. But it wasn't to be. Too many other reactions were happening, and most of the sulfur compound was transported up and away to regions of the atmosphere that could not be observed from the ground.

The researchers hatched a new plan. In 1998, they would park their instruments in the pristine environment of the South Pole and wait for the marine air to bring a pure batch of unoxidized sulfur to them.

Coming to the cleanest place in the world, the researchers didn't expect much else to be happening in the air around the South Pole.

But when they set up their experiments in the Atmospheric Research Observatory, they found the opposite was true.

The intense sunlight of the polar summer drives chemical reactions in the snow, said Georgia Tech researcher David Tan.

The project was called ISCAT for Investigation of Sulfur Chemistry in the Antarctic Troposphere, but the atmosphere contained virtually no sulfur in gas form by the time it traveled across the unexpectedly chemically active ice sheet.

Instead, the instruments were picking up surprisingly high levels of nitric oxide. At first the researchers thought their instruments were incorrect. Nitric oxide is a well-known air pollutant. It is released, for example, during the burning of fuel and it is generated by lightening. It seemed odd that there was so much in the air at the South Pole.

Within a year and a half, four groups of scientists independently discovered the same phenomenon. At the South Pole, snow samples revealed that the chemical is being released from the snow.

Nitrate in the snow reacts with the sun to create nitric oxide. The 24-hour summer sunlight, high elevation and minimum air mixing explains why the concentrations are especially high at the Pole.

The researchers regrouped again under a new four-year grant from the National Science Foundation to look more closely at nitrate transformation in the snow.

"Much of the study now is trying to understand the photochemistry better," said Eisele.

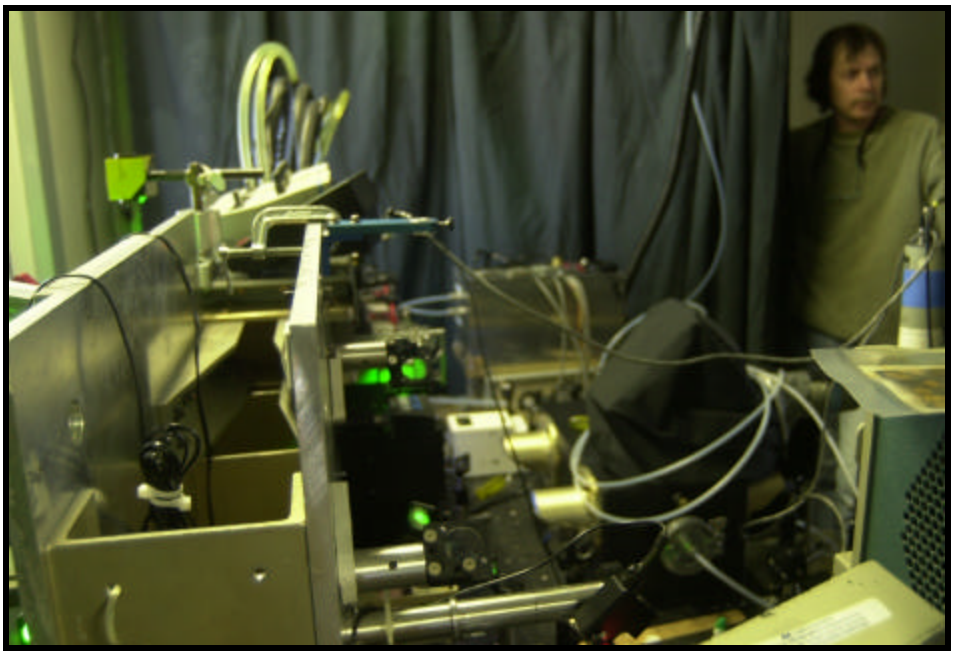

Photo by Kris Kuenning/The Antarctic Sun

Lasers used to study the chemicals in the air at the South Pole whirr and flash in the second floor of the Atmospheric Research Observatory.

"It was like finding the atmosphere of a distant planet plugged into my planet," Davis said.

This time, the project name is without the word sulfur. But the Antarctic Troposphere Chemistry Investigation (or ANTCI) has not lost interest in sulfur.

The production of nitric oxide in the snow of Antarctica actually explains the lack of sulfur at the South Pole.

The amount of nitric oxide in the atmosphere relates to the amount of hydroxyl radical, or HO, a major processor of sulfur.

Davis refers to HO as "Mr. Clean," because it scrubs the atmosphere free of chemicals.

The solar-inspired activity at the South Pole is so vigorous that the scrubbing is equal to that at the equator. The role of the sun was illustrated during the 90 percent solar eclipse in November, when the nitric oxide levels took a sharp dip. While one set of chemical processes destroys ozone up in the stratosphere, chemical activity at ground level is actually producing new ozone, although not enough to balance out the destruction above.

To understand this atmospheric scrubbing better, especially as it relates to sulfur, the researchers are now focusing on the role of nitric oxide.

They want to know if it's produced uniformly around the continent, or in greater concentrations on the polar plateau than at the coast and how the levels change at different altitudes.

To find out, the project has taken to the air. In addition to filling the second floor of the South Pole ARO building with complex lasers and mass spectrometers, the project included 10 flights around McMurdo and the South Pole to measure and compare nitric oxide levels.

Photo courtesy Doug Davis

Doug Davis and Marty Buhr pose with the Twin Otter used to sample the air along the coast from McMurdo for nitric oxide.

Flying out 300 km from the Pole, the researchers found steady levels of nitric oxide. While less prevalent at the coast, initial studies indicate some nitric oxide drains off the plateau into coastal areas.

In the next stage of the project, researchers will study reactive sulfur, nitrogen and hydroxyl radical chemistry over regions spanning the coast to the plateau to learn where and why different sulfur species are deposited in each of these areas - knowledge useful for explaining sulfur deposits in ice cores from around the continent.

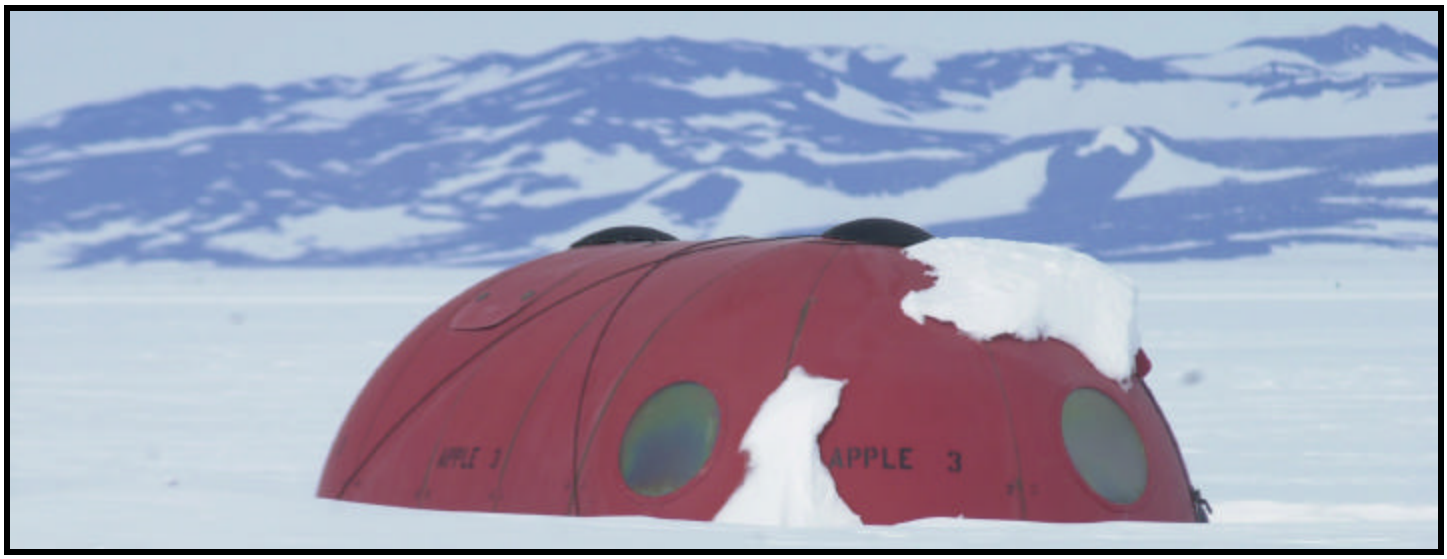

Photo by Kris Kuenning/The Antarctic Sun

Apple huts sprout up around Antarctica

By Kristan Hutchison
Sun staff

The red, round huts on the hike to Castle Rock near McMurdo Station are welcome shelters from the wind for hikers and skiers.

Called tomato huts by some, apple huts by others, the fiberglass domes provide a place to rest, eat and change layers of clothes.

"It's cozy," said Karen Murphy, who stopped in one on her walk to Castle Rock during her time off. "I like the shape and color."

Amy Pashov agreed.

"It's like a little hideaway," she said. "It's kind of like the fort when you were a kid, only with a better view."

Photo by Kristan Sabbatini/The Antarctic Sun

Anthea Wallhead describes how her husband developed the fiberglass structures known as apple or tomato huts. At top, one of the three apple huts at McMurdo Station.

Thousands of kilometers away, halfway up a steep, wooded driveway in Kettering, Tasmania, several slices of red apple hut rest under the tin-roof of a workshop. This is the birthplace of the Igloo Satellite Cabins, as their makers call them.

Sculptor Malcolm Wallhead first drew plans for an eight-panel domed hut in the 1970s, when he was dreaming of a way to live in remote places and escape the pressures of the city. Lacking money to make a prototype, he and his wife Anthea built a log cabin instead, cutting gum and eucalyptus trees that had burnt in a 1966 bush fire and dragging them to the site with a tractor and winch.

In February Anthea served tea in the same cabin, now crowded with books, memorabilia and the paperwork from 22 years building and selling Igloo huts around the world.

"This is sort of the place for inspiration, where all the creativity happens," she said. A photo of her husband, now deceased, sat nearby.

She explained how he had dusted off the hut plans in 1982, when the Australian Antarctic Division called looking for a third quote for modifications to a fiberglass caravan unit. The Antarctic Division wanted to move the caravan as a helicopter slingload, but Malcolm convinced them a dome would be more aerodynamic.

"They can be flown by helicopter 140 miles per hour," Wallhead said.

The first dome was made in four weeks, with the door completed just before the ship left for the Antarctic. Penguin researchers stayed in it over the summer on Magnetic Island near Davis Base. The uninsulated hut is still in use, mostly for storage, Wallhead said.

Pleased with the first hut, the Australian Antarctic Division ordered more. Then other polar programs began asking for the huts.

Over the years the Wallheads built 137 huts in their home workshops. He did the fiberglass work while she helped clean the panels, drill holes and vacuum up after.

"It was usually just the two of us packaging panel after panel," she said.

The designs developed to meet the needs of various Antarctic programs, everything from an all-black version without windows for a dark room, to the one and only Ig-loo with a toilet and shower. The long-lasting huts have stood in winds up to 300 kph at Commonwealth Bay.

The huts are used by 16 countries, including the Australian, American, Chilean, New Zealand, Spanish, Welsh, French, British, German and Japanese Antarctic programs.

"It was exciting because we'd get inquiries from all over the world," said Wallhead, who had her photocopied catalog translated into eight languages.

In all, 112 huts were sent to Antarctica and the sub-Antarctic islands. One was hit by a landslide and another dropped from a helicopter. Most are still in use. Others are used in Norway, tropical atolls, and Australian parks.

"We both had lots of ideas of where else it could be used and couldn't develop them all, obviously, so we concentrated on the polar one," Wallhead said.

The U.S. Antarctic Program ordered its first apple hut for McMurdo Station in 1986. It turned out to be the 27th one the Wallheads built. Eventually eight apple huts went to Americans, including the three still used around McMurdo Station as recreational warmup shelters. Each is stocked with some survival gear in case people are stuck out there overnight.

"They definitely come in handy if a storm were to come in unexpectedly," said McMurdo recreation coordinator Bill Meyer.

Profile The pages of an Antarctic life

By Kristan Hutchison
Sun staff

Colin Bull's polar story begins, and ends, with books. In between he's had enough adventures of his own to write two.

His imagination first sailed into the Antarctic when he was 10, reading *South with Scott* by Captain Evans.

"I was very, very impressed," Bull said. "I determined then, as I've been reminded by my father, that I was going to be a polar explorer."

His chance came in 1951, as a student at the University of Birmingham. He was part of a group of 10 students who organized a geological expedition to Spitsbergen in the high arctic for 12 weeks. They sailed up in a wooden World War II motor-launch ill-suited for the area.

"When one is young, one is allowed to do stupid things," said Bull, now 75. The students worked their way inland from the coast, surveying and sampling areas no one had been to before, Bull said.

Photo by Kristan Hutchison/The Antarctic Sun

Above: Colin Bull with a book from his vast collection of Antarctic works at his home outside Seattle. The collection includes two of his own books.

Left: A younger Bull during his own Antarctic adventures in the '50s.

"We were the first people there and whatever we did was new," Bull said. After the expedition Bull went to Cambridge University, where he was miserable. When he heard from the head of the department that they were looking for people for a two-year expedition to Greenland, Bull volunteered on the spot. A four-man group from the 26-man British North Greenland Expedition surveyed elevations and values of gravity from coast to coast, driving World War II vintage tracked vehicles called Weasels.

"We managed to set the world record for the slowest crossing of Greenland," Bull said. Back then they didn't have the sophisticated crevasse detection systems used on traverses now. One time the Weasel stopped and Bull jumped out to have the snow crumble beneath him. He grabbed a cable attached to the vehicle with one hand as he fell into a 100-foot crevasse.

"I pulled myself out. There was no difficulty," Bull said.

After two years in Greenland, Bull returned to the Scott Polar Research Center at Cambridge and married Gillian, the sister of one of his Spitsbergen friends. They moved to New Zealand, where he had a position at Victoria University of Wellington. But Bull found New Zealand was a difficult place to do science.

"The only other thing I was good at was polar exploration," said Bull, who put together a four-person expedition to Antarctica's Wright Valley in 1958. He kept the cost low, $200 per person, by finding sponsors. Cadbury gave the team one ton of chocolate.

The following year he organized a return expedition, though he wouldn't be going because his second child was due to be born during the field season. The fifth volunteer for the expedition team had good graduate work and the record for the fastest crossing of New Zealand's Tararua mountain range, but happened to be a woman. Bull put her on the team, but the U.S. Navy would not fly a woman in their helicopters. That set the challenge to Bull, who continued to try to get women scientists to the Antarctic. He finally succeeded in 1969, sending down an all-female research team to the Taylor and Wright valleys. By then he had moved to Columbus, Ohio to help develop the Institute of Polar Studies, now the Byrd Polar Research Center. He was the second director of the research center, from 1965 to 1969. Bull kept finding reasons to return to the Antarctic himself, going on several oversnow traverses, continuing to work in the ice-free area of South Victoria Land, and on Deception Island.

"McMurdo was too civilized even then," Bull said. "The thing to do was to get out of McMurdo."

His expeditions came to an end after he became Dean of Math and Science at Ohio State University in 1972. While dean, he was on the thesis committee for Julie Palais, who is now glaciology program manager for the National Science Foundation.

"He's kind of like a jolly Antarctic Santa Claus, with lots of stories to tell," Palais said. "I think he tells basically the truth, it's just sometimes they're embellished a bit."

A sign over the path to Bull's front door warns the gullible they are entering the "Bull zone." Why is obvious, as he launches into an eyebrow raising story of how he ruptured his Achilles tendon playing lacrosse with the high school girls team.

"And if you believe that, you're just the person to interview me," Bull said from his home overlooking the Puget Sound. In 1985 he retired to an island near Seattle to write, collect and sell polar books. His first book, *Silas: The Antarctic Diaries of Charles S. Wright*, was published in 1993. All he needs for his second book, *Innocents in the Arctic*, about the Spitsbergen expedition, is a publisher. He has a title for his next book already, a polar cookbook called *First Catch Your Walrus.*

"I like writing, but it's a tedious business," Bull said. His collection of other people's stories is even larger.

"I have read nearly all of them," said Bull, surrounded on three sides by floor to ceiling bookshelves holding about 6,000 polar books. Bull says the best of the Antarctic books is *The Worst Journey in the World* by Apsley Cherry-Garrard. His second favorite is *Cold* by Larry Gould. Bull has met both authors.

Bull last went to Antarctica six years ago, as a guest speaker on a cruise ship.

"Because I was capable of standing up in the Drake Passage while everyone else was in bed, I gave eight or more lectures."

With that trip he's been to the Antarctic continent at least 12 times and cruised to the Antarctic eight times.

"It occurs to me that I've been enough times," said Bull, making plans for a trip to Portugal instead. "When you've seen one square yard of ice, you've seen them all."