

The Antarctic Sun



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

Balloon bursts flight record

By Mark Sabbatini
Sun staff

Researchers said they may have collected more data during a record-length high-altitude scientific balloon flight than from more than 40 years of previous flights combined.

The unmanned flight achieved two firsts by orbiting Antarctica twice during a flight lasting nearly 32 days and sending back new data from the depths of outer space along the way. The balloon, nearly brought down after the first orbit due to equipment problems, landed about 284 miles from McMurdo Station at 3:30 a.m. Jan. 22 after traveling about 8,800 miles.

"If there's ever a balloon Cinderella story this is it," said Lauren Scott, a graduate stu-

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Ice lures adult students to learn

By Melanie Conner
Sun staff

In seeking her high school diploma, Maryan Hassan, 41, who speaks English, Somali and Arabic, now studies the language of Antarctica.

She studies through the experiences of her teacher Susan Cowles.

Last month Cowles traded her chalkboards for a computer and her textbooks for a science lab when she left her classroom in Corvallis, Ore., for Palmer Station on the Antarctic Peninsula. Cowles is the first to teach high school completion classes for adults through the National Science Foundation's Teachers Experiencing Antarctica program.

"For one reason or another, their formal education was interrupted," wrote Cowles in an introduction to her Web site. "Now

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Photo by Jeanne Cato/Special to The Antarctic Sun

A killer whale surfaces last week behind the Coast Guard icebreaker Polar Sea in McMurdo Sound. Researcher Robert Pitman believes the orcas that frequent the open channel carved by the breakers may be a unique species.

McMurdo whales may be unique

By Kristan Hutchison
Sun staff

Steadying himself in the bouncing bow of a speeding launch boat, Robert Pitman aimed his crossbow at the black body of a killer whale as it arced through the water.

The dart bounced off the leathery skin and floated on top of the water until Pitman retrieved it. The whale swam away, but researcher Pitman got his prey, a sample of whale skin the size and shape of a pencil eraser which he popped out of the dart's tip and into a plastic tube. The sample could prove whether or not the orcas in McMurdo Sound are a different species than others in the world.

"Historically there's been one species of killer whale, and it's found throughout the world oceans," said Pitman, preparing to prove history wrong. The darts he uses are tipped with metal cylinders, like a tiny, round cookie cutter, rather than barbs.

Commercial whalers were the first to realize there may be more than one species in Antarctica. In 1979 - 80, Soviet whalers went on a hunting spree in the Antarctic,

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INSIDE

Antarctica on
tour, for a price

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Katy Jensen's
done with it all

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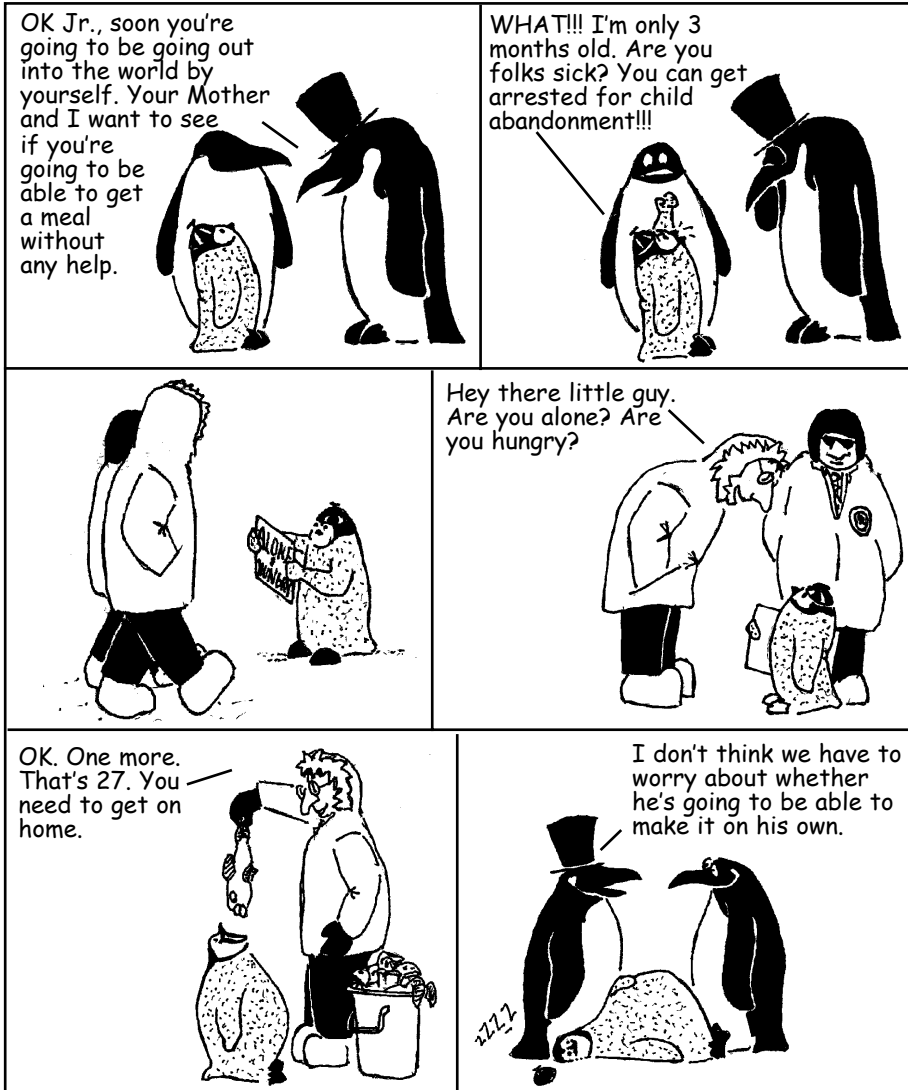
Quote of the Week

"I suddenly felt weird...Oh, wait, that's the sun on my back."

- A South Pole worker stepping outside during R&R at McMurdo Station

Ross Island Chronicles

By Chico



Cold, hard facts

Coming and going

Original name of the Green Wave supply ship: **MS Woermann Mira**

Green Wave dimensions: **507 feet long, 69 foot beam, 26 foot 9 draft**

Speed: **17 knots**

Supplies coming on Green Wave: **391 containers including 45 of refrigerated food, plus 659 larger items. Total weight 12.16 million lbs.**

New items for the store this year: **23 new t-shirt and fleece designs, 14 new ballcap designs, various shotglasses, mugs, pins, patches and stickers.**

Number of containers leaving: **278**

Large items to be auctioned: **33 items including "Fuzzy" the bulldozer, "Rainbow Warrior" the military tow truck and eight sprytes.**

Source: Derrold Burnett, Lee DeGalan, Jay Fox, Helen Trujillo

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All things science

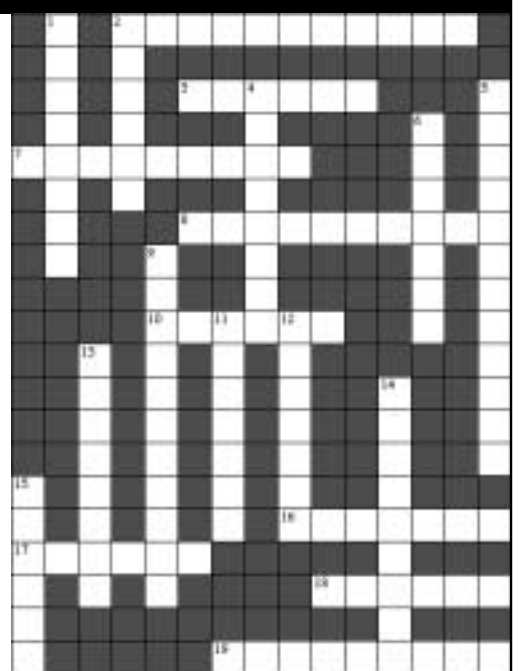
Across

- 2) Moves electric signals
- 3) Overwater transporter
- 7) Render correct
- 8) An assumption
- 10) Portable equipment
- 16) A Swedish astronomer
- 17) In the field
- 18) Also known as a grantee
- 19) Up and up

Down

- 1) Looking for new knowledge
- 2) A proposition
- 4) An information line
- 5) Another name for a grantee
- 6) Underwater wear
- 9) To work in sync
- 11) Carried away by balloon
- 12) Containing carbon
- 13) Trimmed techie talk
- 14) Precious air time
- 15) Method of sample collecting

answer on page 6



Pole tunnelers create a world under ice

By Judy Spanberger

Special to *The Antarctic Sun*

South Pole Station sits on a relatively smooth white surface, hiding a web of tunnels.

Buildings dot this surface, but there is seemingly no man-made connection from one structure to the next. No walkways, no paved roads, no paths that last beyond the next storm. Most noticeable, however, is the lack of power lines stretching from one place to the next.

All the utilities are below the surface of the snow to keep them protected from the elements. A utility line mounted on the surface that might need repairs would be impossible to access, as it would surely be under a snowdrift. But were the lines to simply be buried in the snow, they would be just as difficult to work on, and so here at Pole the lines run in tunnels that are 18 feet below the surface and graded down to 45 feet below.

The utilities under the dome are in large, metal culverts that are big enough to stand up in, called utilidor. The utilidor. They weren't required to be very long at that point in time, but the Pole has expanded to include various out-buildings and will be expanding even more with the new elevated station. Utility lines will be needed beyond the camp boundaries to connect the new Rodwell building, which provides water for the Pole station, and the new sewer outfall, as well as outfall sites for the future. It seemed an expensive and lengthy process to run a metal utilidor for the several thousand feet needed, and so the decision was to simply bore a large square tunnel through the snow under the surface. A tunnel would provide a constant temperature of minus 50F (versus a surface temp of minus 100F or colder during the Austral winter months), protection from drifting and a sheltered place for any necessary repair work, just as a utilidor would.

The snow here at Pole is ages old, extremely dry and thus very dense.

"This snow is so dense you could mount a bar into the side and do chin ups off it," said John Wright, the tunnel foreman.

Digging a tunnel here is like trying to grind through cement. No available tunnel machinery seemed up to the task, particularly under the harsh conditions here, so the National Science Foundation had the U.S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory (CRREL) design a tunneling machine specifically for use at the Pole. It wound up costing one million dollars. The machine is loosely patterned after a "road header" tunnel boring machine, and is essentially a bobcat with a Kubota snowblower attached to the front with the snow blown several hundred feet out of the tunnel onto the surface through piping.

The CRREL tunnel machine was first brought to Pole in 1995 for a test run. The run proved the concept and gave the tunnelers a place to start, but nothing much was done again until 1998, when Wright came on board. His first year Wright, who'd worked on mining and tunnel crews in the States, prepared for tunnel operations in the snow both by hand and with the machine. The following year 964 feet of tunnel was completed and during the 2000/2001 season 940 feet of tunnel was carved out. This year, the final season for the tunnelers, they will have ground out 1,096 feet of tunnel.

To start a tunnel, first a trench about 40 feet deep and 50 feet wide is dug. Digging a trench can be an interesting experience in



Photo by Andres Martinez/Special to The Antarctic Sun

John Wright, above, watches the tunneling machine bore into a wall of snow.

At right, Wright pokes his head from a doorway to look down the length of the tunnel. Utility lines will be strung through the tunnel connecting the new elevated station and out-buildings to power, water and sewer.



Photo by Judy Spanberger/Special to The Antarctic Sun

and of itself. This year a parachute from 1957 was stumbled on about 25 feet down. It turned out to be one of the parachutes used to drop in materials for the construction of the first South Pole station. The tunnel, which is six feet wide and 10 feet high, is then started in the side of the trench and dug to its proper length. A new trench is dug for a tunnel that will meet up with the original one at a right angle.

See Tunnel on page 6



Perspectives Perspectives

Learn the lingo

shuttle driver:

Employees who drive vans and various large all-terrain vehicles to a handful of locations at or near McMurdo Station. Locations include the various ice runways located several miles away and New Zealand's Scott Base about two miles away.

the balloon: A really big unmanned scientific balloon (5,000 pounds) that is launched regularly with various equipment to conduct experiments at 125,000 feet altitude.

the transition: Usually refers to the area between land and the sea ice. The ice is rugged and uneven near shore, making for a bumpy ride until vehicles complete the switch to the land or ice road.

Delta: A large all-terrain vehicle used to carry passengers and/or gear.

Typically a couple of people fit in the cab with the driver. A dozen more people sit in a separate rear compartment with their gear.

fuelies: Workers at the ice runways who refuel aircraft.

beakers: Common slang for scientists.

DAs: Dining attendants, who do everything from dishes to making sandwiches.

GAs: General assistants. They may do anything on any given day from the lofty work of helping scientists at penguin colonies to the grimy task of sorting garbage.

Derelict Junction: The bus stop at McMurdo, consisting of a three-walled shelter near the center of activity.

On the road again and again and again...

By Ben Murray

Special to The Antarctic Sun

I want to make a confession. As a shuttle driver, I sometimes ask questions I already know the answers to, just to keep conversation going ("They cut the balloon down yet? When they shippin' you out? Did'ja get that mole removed?"). I'm sorry. I know it's somewhat shallow and transparent, but I'll thank you to remember that you do it too ("How's the transition? What mole?"). The truth is that I like talking to passengers, but stare at the snow long enough and you run out of good questions sometimes.

I should be frank that I have only been driving a shuttle for half the season. In mid-December I shed my rubber janitor's gloves for a pair of leather driving ones and took to the open road. My zeal was perhaps a touch unwarranted being that the open road of McMurdo Station is a six-mile stretch of snow with two turns in it. Regardless, when the Delta fleet staged a coup d'etat and overpowered the flimsy maroon vans of our normal trade, we became more like yacht captains than drivers anyway, piloting our vessels inch by inch toward Willy.

Whatever the vehicle, being employed to drive in circles is a unique occupation in Antarctica, and enough trips onto the ice will do odd things to a person. Seizures, nausea, hallucinations. I once had an experience in which a disembodied voice was telling me to slow down, slow down and just sleep, sleep little one, everything was going to be ok, the little furry bunnies would drive for me... I have since stopped letting fuelies ride in the front, for I believe it was a mix of fumes that brought this on.

In either case, ours is an occupation teeming with both fame and hazard. As glorious as it might seem, there are a few minor downsides to being a Delta jockey. For instance, there is the vocal strain of trying to scream my questions to passengers over the whine of the engine. That smarts, but not nearly as much as the acute pain which comes with the humbling knowledge that a one-legged man on a unicycle could beat you out to the airfield without raising his pulse.

The upsides of driving a shuttle in any vehicle, however, far outweigh the down. There is the illusion of absolute power; that behind the wheel you command the road, the destiny of your passengers, the radio. The latter is the most important, because as the people who control the music, we are the dictator of our riders' moods, and, consequently their productivity. I find that the *Top Gun* soundtrack keeps planes in the air (pilot motivation), Jimmy Buffet keeps

them grounded, inducing apathy.

There is also the particular pride I take in distinction of being The Lowest-Paid Person on the Continent. I scoff at those opulent, money-grubbing DAs and GAs. I'm sure some beakers will dispute my claim to destitution, but being of royal lineage (my father is an Elks Club member, my mother has been to Britain) I feel that the title aptly matches my distinctly regal countenance, the near-princely visage I project when knocking dirt off my mud flaps. I went through a period last month where I insisted that everyone address me as The Supreme Lord of Abject Poverty, and I refused to let anyone onto my shuttle until they agreed to call it His Majesty's Royal Coach. I wore a velvet cloak. This all played very well until I had to get on the I-Net and explain that His Majesty had His Coach stuck in the transition. I ditched the cloak.

Still, shuttle driving also presents diverse ways in which to support science, and I'm thinking of setting up some new experiments in and around my little shuttle. For instance, I want to find the exact point of transformation between when a person expects the shuttle to leave on time and when they expect it to leave early because they are already on it. I suspect it's somewhere right around the time they enter door of said van or Delta, possibly just after they sit down. Riders wanting to catch the shuttle at 3:29 expect it to be there, whereas anyone that got on at 3:25 has spent four minutes in supreme agony, moaning, speaking in tongues, pleading for us to drive, for the love of Pete, drive...

It is in this vein that I'm working with the Navy on counter-torture techniques and how to resist persuasion and coercion. People will try anything to get a shuttle going early. Many use cold logic: "We're full. Look, we're full, we couldn't squeeze a dime between me and this LDB guy - why don't we just go?" Some sweet-talk me: "I'll bet you're a real good driver. Show me..." Others flatly lie: "They said they weren't coming." And some just desperately grab at any shred of possibility they can come up with: "Your clock is slow... and your watch. OK and my watch, but I swear Jim Scott said this was OK. Honest. I called him."

In all truth, working as a shuttle driver is a good time. We meet tons of people, we're out and about most of the day, and the gas is free. With some mirrored sunglasses it's not that hard to catch a nap in between the two turns in the road. When you see a maroon van, be comforted that we like to pick people up, we hate the word "full" as much as you do, and we're going that fast because there aren't any cops in Antarctica. Buckle up.

around the continent

PALMER

Visit from Argentine Navy

By Tom Cohenour
Palmer correspondent

Among the new faces to recently arrive at Palmer Station is Susan Cowles, a Teacher Experiencing Antarctica (TEA) who joined with science group BP-045-P (Ducklow), which is conducting research on the Transport and Fate of Persistent Organic Pollutants in Antarctic Coastal Seas.

Susan teaches basic skills to adults at Linn-Benton Community College, Corvallis, Ore. In 1996, she was named a Literacy Leader Fellow by the National Institute for Literacy. During 1996-1997, Susan created curricular materials for use of Internet-based resources in teaching and learning, with a special emphasis on adult literacy learners and instructors. She also coordinated a technology team of adult basic skills instructors from various geographic regions and literacy programs throughout Oregon. Information about Susan and the work she does can be found at <http://www.nifl.gov/susanc/inthome.htm> and <http://literacynet.org/orweather>.

When the Argentine Navy visited Palmer, Susan took the opportunity to interview some of the officers. Here's what she wrote:

Palmer was visited by the Argentine vessel *Armada Republica Argentina (ARA) Castillo*. This ship was built in 1943 for the U.S. Navy, and its name was the *U.S. Takelma*, an ATF 113. The *Takelma* served in the U.S. Navy in World War II, the Korean War, and the Vietnam War. It was a part of the auxiliary tug fleet until it was de-commissioned in 1972.

In 1994, the ship was purchased from the U.S. government by Argentina. It was commissioned in 1995 as Argentina's *ARA Castillo*. It has been upgraded with many sophisticated communications instruments. Its home port is Mar del Plata, Argentina. The *Castillo* is 62 meters long (202 feet) and it has a crew of 60. Seven members of the crew came to Palmer

Station while the ship was anchored in Arthur Harbor.

The *ARA Castillo* is a part of the Antarctic Patrol. Argentina and Chile work together as this patrol, known as Patrulla Antarctica Naval Combinada. Ships in this patrol come to Antarctic waters from November to March every year.

The mission of the patrol is to help preserve the ecosystem here. They work to help any ships in distress.

They have four navy divers onboard the ship. These divers can use skimmers and sea barriers in case any vessel has an oil leak or other damage. For example, if a cruise ship comes into contact with a large iceberg, these divers can go underwater to assess any damage to the ship and then help in the necessary clean up!

Another ship to arrive at Palmer this week was the 325-foot (100-meter) tour ship *M/S Clipper Adventurer*. Built in 1975 in Yugoslavia, she carries a maximum of 122 passengers and 85 crew members. Visitors came ashore in Zodiacs for a station tour and afterwards went to Torgerson Island to visit the Adelie penguin rookeries.



Photo by Kevin Culin/Special to The Antarctic Sun

A game of tug-of-war at the South Pole County Fair.

thing they're not able to do during their usual 30 minutes on the ground, so hopefully it was more of a field trip than a huge inconvenience to them. They spent the night in gym and were able to return to McMurdo in the morning. Never leave McMurdo without your toothbrush.

FEMC topped-out the steel on the new elevated station this week. Truly an accomplishment in this climate. It's a pleasure seeing the American flag flying on the end of the new station. (Normally a small evergreen tree is mounted when the

steel for a building is topped out, but we couldn't find our tree.) When the steel crew was asked how they felt about finishing their work they responded "Great. Send the plane: We're ready to go home now." Many of the panels are up on A3 (the third pod) and will be enclosed and heated for the

winter. The station is indeed becoming a reality thanks to the hard work of the FEMC crews who work 'round the clock every day no matter the weather. It's no wonder they need to eat 5,000-plus calories per day.

A group of seven scientists are here from the University of Texas for two weeks to establish four remote Global Positioning System (GPS) stations. This McMurdo-based project lead by Dr. Ian Dalziel as PI, is initiating a GPS network to measure crustal motions in the bedrock surrounding and underlying the West Antarctic Ice Sheet. They are flying via Twin Otter to the remote locations and camping in the field for about three days to collect the necessary data. In succeeding years, they plan to return to the same loca-

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SOUTH POLE

Station steel complete

By Judy Spanberger
South Pole correspondent

We maintained our reputation as the world's southernmost motel this week. Two LC-130 Hercules crews and their aircraft were "stranded" at 90 South due to bad weather at McMurdo. The flight crews were given a tour of the station - some-

the week in weather

McMurdo Station
High: 40F/4C Low: 12F/-11C
Wind: 30 mph/48 kph
Windchill: -29F/-34C

Palmer Station
Not available

South Pole Station
High: -10F/-23C Low: -26F/-32C
Wind: 29 mph/46 kph

Pole From page 5

tions and measure the new locations of the monuments established this year, thereby measuring the movement of the Earth's crust. We have reached our maximum capacity of 220 at Pole, so this team has been camping out in small tents dotted around one of our housing units.

South Pole is hosting an expedition from the British Antarctic Survey (BAS). The BAS team is preparing several remote magnetometer stations and battery packs that they are deploying out on the polar plateau. They arrived last week from Halley Station on a Twin Otter which will be flying them to the remote field locations. They'll only be with us for a few more days, and by the time you read this will no doubt already be gone.

The South Pole logistics crew hosted the South Pole County Fair this past Sunday. We had BBQ and snacks, three-legged races, sled pulls, tug-of-war teams, South Pole rope jousting, music, and lots of chatter and laughs. Prizes of milk and certificates for Christchurch ice cream were handed to the winners of the races. It was a nice way to spend a Sunday afternoon. Just like home.

Our weather has been hovering around minus 10 with wind chills in the minus 40s. This is rather warm weather for this time of year, but we're expecting things to start their usual turn of dropping a degree or two each day through the rest of the season (station close is slated for Feb. 15 this year).

Feb. 3 is the FINAL ISSUE of The Antarctic Sun. After that, read past issues wherever you are at www.polar.org/antsun

Crossword answer from page 2



Photo by Andres Martinez/Special to The Antarctic Sun

Tunnel workers mark the snow wall beside the parachute they found while digging earlier this season.

Tunnel From page 3

It takes a fair amount of skill and planning for the tunnels to meet up on the same level, and often the tunnels are surveyed. The more difficult joining of tunnels is starting a tunnel at two opposite ends and meeting in the middle. It's rather like finding your way down an unfamiliar set of stairs in the dark. Last year Wright and his crew achieved this when at 8:37 p.m. on Jan. 4 they connected a tunnel from opposite ends. Perfectly. The only mark of the meeting point is a piece hanging from the ceiling, a monument that remains as a reminder of a job well done.

Tunnelers, or at least the ones down here, are a unique and hard-working group. The average age of the tunnelers is 52, but they are proud to announce that they are the youngest tunnel crew on the continent as well as the best looking. They have nicknames like "Stranger," "Ranger" and "Danger" and they all seem to be well above average in height. The crews work in two shifts operating the machine. There have been times the machine was down for some reason or another and they continued on manually, carving out the tunnel with chain saws and pulling the blocks out on banana sleds. Wright maintains that his crews have out-performed the machine each and every time, but it's much harder work without the machine.

Being a tunneler, or "miner" as they're sometimes called, is physically demanding and sometimes dangerous work, but it has its rewards. There's the opportunity for precision, particularly when joining tunnels, the tangible evidence of a job well done and the camaraderie of your fellow tunnelers, those people who watch your back as you work under the surface.

The tunnel is sparkling clean, bright white in the lights that are strung up and seems to go on forever. The utility lines that have been mounted thus far are hanging from rods that have been simply screwed into the ceiling.

Along the way are risers, or holes, that lead up to the surface. These are the escape hatches, each marked with a lighted exit sign sticking inconspicuously out of the snow.

There's a peacefulness about the place. With the lights off it's so dark you can't tell if your eyes are open or shut. It's also amazingly quiet...until something on the surface drives over and then we hear a distant crunch as the tracks of a Caterpillar make their way across the snow. Wright has spent so much time in these tunnels he can tell which machine it is or who's walking by the sound of their step.

At one point Wright grabs my arm and pulls me aside as if saving me from being hit by a car.

"Gotta watch out for them renegade neutrinos," he deadpans, "they're fast and stop for no one."

We complete the tour by stopping in one of the warm-up shacks, placed in small holes carved into the side of the tunnel. The shacks are necessary in the constant 50 below temperature. On the wall of the shack are tunnel plans and a small bit of graffiti - "Your Tunnel And You in stores now."

As of Jan. 22 the tunnelers surpassed the 3,000 feet mark, and by today they reached "deep enough," the mining term that means you are done. No more will Polies see snow from the machine shooting 40 feet into the air.

The tunnelers leave an inscription above the tunnel entrance: "Long Live Hope."



Photo by Mark Sabbatini/The Antarctic Sun

Jonathan Silverman, 11, shops for souvenirs in the South Pole gift shop. Silverman's trip to the Pole with his father may earn him a spot in the Guinness Book of Records as the youngest person to go to both Poles.

The \$25,000 tour

By Mark Sabbatini
Sun staff

The twin-engine plane lands on the ice runway of Amundsen-Scott South Pole Station at about 10:30 a.m., coming to a stop in front of a handful of top station officials. A female tour guide opens the door and everyone greets one another by their first names.

"It'll be just a few minutes," she says. "People are getting all of their clothes on."

A short time later about 10 people emerge one by one from the plane in heavy weather gear, enthralled with the cloudless sky and balmy temperatures hovering near 0F (-18C). One woman is carrying an alto sax, a man nearby is wearing a full tuxedo under his parka and the shortest member of the expedition turns out to be an 11-year-old boy - a rare sight on the continent.

For many, today will be the highlight of a 10-day, \$25,000 trip provided by Adventure Network International (ANI), the only land-based tour operator on the Ice. The visitors have spent the past several days skiing, hiking, riding snow machines and living in tents at ANI's

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Photo by Mark Sabbatini/The Antarctic Sun

Jessie Hill, a Philadelphia teacher, plays "Crazy" at the South Pole while Ron Endeman dances with his wife Judy.

Ice for a price

Tourists drawn to visit and protect Antarctica's pristine beauty

By Mark Sabbatini
Sun staff

The difference between tourists and scientists, according to Lisa Holliday, is scientists assume they have a right to be on the Ice.

Holliday, an Antarctic field guide and former employee at New Zealand's Scott Base, said she loved learning about the continent's diversity while working with scientists at the base. But she said visitors, who often are experts about Antarctica by the time they get here, also have their place.

"My personal opinion is we're all tourists and we just have different reasons," said Holliday, a resident of Makarora, New Zealand, during a recent trip with a group of visitors touring the South Pole.

There's concern about the future growth and potential impacts of Antarctic tourism, yet visitors arriving during the 1980s played a key role in getting many research sites to clean up their habits. A visitor's misguided footsteps can mar the landscape for decades or change an animal's nesting habits, but those with positive tales to tell when they

return home help provide the support and funding needed for science programs.

"We get a lot of scientists who are incredibly aware and Antarctica's their passion, so the last thing they want to do is mess it up," said Belinda Sawyer, an assistant expedition leader for Quark Expeditions, during a Jan. 8 visit to McMurdo Station aboard a ship carrying about 70 visitors.

About 14,500 people are expected to set foot on Antarctic soil - or ice - during the 2001/02 season, virtually all arriving on tour ships carrying fewer than 400 passengers, according to the International Association of Antarctica Tour Operators (IAATO). Most will sail to the Antarctic Peninsula where Palmer Station is located.

Another 2,400 will arrive on large cruise ships which will not dock. About 3,600 more will see the Ice from far above on sightseeing flights offered by commercial airlines.

A significant increase, particularly in visitors aboard large cruise ships, is projected by the 2005/06 season. About 20,000

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Pole tour From page 7

camp in Patriot Hills three hours away, but the Pole is the featured part of the tour.

The group is brought quickly into the station, passing the geographical South Pole near the plane's landing site without pause. They enter the landmark dome that covers many of the station's facilities and walk a few hundred feet down the maze-like corridors to a set of steps that leads to the upper floor of the galley - away from where the kitchen staff and most workers congregate.

"The first thing I'd like to do is make sure everyone is feeling all right," said Katy Jensen, the station's area manager, as the guests are served water and cookies after a brief restroom break.

The station is 9,300 feet above sea level, she explained, but the effective altitude is 10,600 feet because the Earth's atmosphere is thinner at the Poles. United States Antarctic Program policy prohibits supporting private groups, but Jensen said the station's clinic is available if anyone develops symptoms of altitude sickness.

She then has the station officials and guests introduce themselves before giving a brief overview of the facility using posters on a nearby wall for reference. One of the first questions asked is how many scientists are at the station - about 50 of the 220 people here for the summer is the answer - and subsequent questions about science will be the main focus of today's visitors.

The group then gets a short presentation by Bob Morse, principal investigator for the AMANDA project, which is studying particles from the galaxy and beyond that have passed through Earth. Then, after another bathroom break, it's time to go shopping.

The tour pauses briefly under the dome between the galley and administrative building where the gift shop is located, where Jensen provides a few architectural details. The store is small, so the group spends about an hour shopping in shifts for South Pole hats, t-shirts, miniature teddy bears and other items. Those waiting outside in the hallway use the station's

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Tourism From page 7

people are expected to set foot on land, about 5,500 are expected on sightseeing overflights and visitors aboard large cruise ships that do not dock are expected to more than double to 6,000.

Their reasons for coming can be as varied as the projects researchers work on.

Jonathan Silverman, 11, wanted to make the *Guinness Book of Records* as the youngest person to reach both poles. Judy Endeman, a retired school superintendent, came to watch birds aboard a cruise. Chuck Cross, a travel agent from expeditioncruises.com, came to McMurdo for his 48th trip to the Ice just to be more familiar with the cruises he sells.

They pay anywhere from \$800 for a

word about their positive experiences and the work occurring on the continent when they return home.

"I think the ripple effect makes people want to fund the National Science Foundation," he told Jensen.

There are restrictions adopted by the U.S. and other countries intended to minimize the impact on the environment, workers and researchers, while also seeking to ensure the safety of visitors in what is often a harsh and unfamiliar setting.

Visitors to Palmer Station generally must give 72 hours advance notice before visiting so station personnel can prepare and adjust their schedules, wrote Station Manager Bob Farrell in an e-mail. There

A tourist plane takes off from the South Pole.

Photo by Judy Spanberger/
Special to The Antarctic Sun



poor seat on a 12-hour overflight to \$25,000 or more for a 10-day land trek that includes a day trip to the South Pole. But inland visitors are rare: Only 139 people participated in land-based tours during the 2000/01 season, according to IAATO.

Many workers in Antarctica said they would never consider paying such fees - especially at the high end - for a few hours or days on the Ice, but virtually every visitor interviewed called it money well-spent.

"It's not what it costs," said Dick Marafioti, a retired orthopedic surgeon from Los Angeles, during a trip to the Pole. "It's what it's worth."

Marafioti, Silverman and a handful of others aboard a small plane got a very limited tour during their three hours at the Amundsen-Scott South Pole Station. But a brief orientation in the galley, a trip to the gift shop and an hour of taking pictures at the Pole - with the visitors asking Area Manager Katy Jensen a barrage of mostly science-related questions - is more than U.S. officials provided during some past years.

"This is really the most flexible we've ever been," Jensen said. "Every year we try to open the station up a little bit more."

The open approach is probably best for the United States Antarctic Program, Marafioti said, because visitors spread the

are also NSF-imposed limits.

"We limit the number of cruise ship visits to the station to 12 per season with only about 40 passengers onshore at any time," he wrote. "Groups of 10 to 12 are given walking tours of the outside of the station, they visit our aquarium tanks displaying the undersea life of the area, they have an opportunity to shop at the station store and then they are given refreshments in the dining room before returning to the ship."

"In some cases we do welcome visitors on short notice, but usually just for vessels of other Antarctic programs," he added.

The station is offering "offshore lectures" on a trial basis this year for visitors on two large cruise ships that aren't docking at the station, Farrell wrote.

"In these cases, a group from the station travels out to the ship in one of our zodiacs," he wrote. "We give a PowerPoint presentation with an overview of the USAP and specifics on Palmer Station ... This is a great opportunity to share information on the USAP with people that would otherwise not have the opportunity."

U.S. officials at research stations and with the Environmental Protection Agency credit most tour operators with following the rules and taking extra steps to minimize their impacts.

See Tourism on page 9

Tourism From page 8

"They are generally very considerate and appreciative of the opportunity to visit Palmer Station," Farrell wrote. "Their passengers, particularly the American passengers, come away with a sense of pride for what is being done here and in the rest of the USAP. Their enthusiasm serves to remind us fortunate enough to work here of what a special place this is."

IAATO guidelines are followed by nearly all visiting ships and include washing the boots of people going ashore to prevent contamination and strict guidelines on approaching wildlife. Some operators will not allow two of their vessels to be in the same vicinity at the same time. Adventure Network International, which offers the continent's only land-based tours, has strict



Tourists from the Kapitan Khlebnikov gather outside Scott's Discovery Hut in early January.

Photo by Melanie Conner/
The Antarctic Sun

environmental policies at its Patriot Hills base camp and maintains a cache of supplies at the South Pole to ensure self-sufficiency if unforeseen circumstances occur.

Visitors usually arrive well-instructed in the ways of the Ice: One guidebook even advises them to use the restroom before leaving their ship and never to ask to use a bathroom at a research station, since waste disposal is often complicated.

"I would think that anybody that came to Antarctica would have the goal of keeping it pristine," said Tracy Sheeley, a communications coordinator from Talkeetna, Alaska, who is spending her fourth season at the South Pole.

There is no single sovereign government in Antarctica. Instead it is governed under the Antarctic Treaty. Rules are adopted by the treaty members and enforced by each country on its citizens. Still, there are concerns about possible impacts on the environment from tourism.

The growth of tourism - expanding from 2,500 visitors during the 1988-89 season to the 14,500 projected this year - is also a concern. The Antarctica Project, a nonprofit conservation group based in Washington, D.C., stated in a report to IAATO last year that "it is not only how tourism is conducted, it is a problem of scale and distribution."

Land-based "adventure tourism" is expanding, technological advances are

allowing the continent to be visited during more times of the year and larger-scale cruise ships are increasingly seen, the group noted. The biggest concern, according to the report, is a potential change in attitude about Antarctica over time.

"Incremental increases or changes in activities lead to incremental changes in attitude, leading to further increases or changes in activity," the group noted. "Over time larger impacts are seen as acceptable because it is too difficult to change course."

Studies by private and government agencies over the years have generally shown relatively little environmental impact from tourism. But many of the reports also note there isn't enough data to get a complete picture of the overall situa-

tion.

IAATO's most recent assessment of tourism's impact on the continent recommends long-term researchers track animal behaviors and other environmental factors to ensure tourism isn't having a negative impact, but doesn't anticipate problems in the near future.

"At current levels of growth we believe that tourist activities both historically and those planned for the next five years will continue to have no more than minor or transitory impact on the biological, and physical aspects of the Antarctic Peninsula," the report notes.

One area of agreement for many researchers, visitors and tour companies is Antarctica's pristine condition is one of its main selling points, so it's in the best interest of commercial operators to help keep it that way.

Silvia Cangas, a resident of Spain who took a tour of McMurdo earlier this month, said the raw, untouched beauty of the Ice is what lured her and she doesn't want to see it lost.

"It something that human beings (haven't) yet spoiled, and perhaps because (of that) you can see the work God begun and hasn't yet finished," she said.

Sun editor Kristan Hutchison contributed to this report.

Pole tour From page 8

rubber stamp collection to mark passports and postcards, and a few wander into the library in the next room to shoot an informal game of pool.

The final hour is devoted to the traditional "hero shots" at the geographical South Pole and the more decorative ceremonial Pole a short distance away. Jessie Hill, a Philadelphia teacher, takes out her saxophone and plays "Crazy," fulfilling the suggestion of a longtime friend to play the instrument at both poles.

"(The cold) messes up the timing, but if you're playing alone maybe it doesn't matter," she said.

As Hill plays, Ron Endeman, clad in his tuxedo and "Cat-In-The-Hat"-like hat from the gift shop, fulfills one of his goals by dancing with his wife Judy. The next thing he does, as a member of the Travelers' Century Club (for those who have been to 100 countries or more), is add six countries to his traveling resume all at once by circling the Pole.

A landmark achievement is being recorded nearby as Neil Silverman of Fort Lauderdale, Fla., takes pictures of his 11-year-old son Jonathan. It's more than a "hero shot" - the picture will be sent to the *Guinness Book of Records* as proof Jonathan is the youngest person to visit the north and south poles.

His favorite of the two?

"The South Pole, by a lot," he said. "At least there's something here."

Many of the other visitors have also been to the North Pole, which lacks the station and facilities at the bottom of the world. Other inspiring factors for some were books they read about the South Pole, making the trip as an extension of the cruises that bring most visitors to the Ice, or simply getting a ground-level look at the interior of the continent.

After an hour of shooting photos - and about three hours total at the Pole - many start feeling the chill and are ready when the announcement to get back on the plane comes. The trip wasn't cheap, but all of those interviewed said they'd make the same decision again.

"In a New York minute," Ron Endeman said. "It was spectacular."

Teacher

From page 1

they've come back to school to complete a high school equivalency program or to improve their skills in reading, writing and math."

Hassan and other students in Cowles' class log on to the Internet each week to read Cowles' weekly journal entries, describing daily living situations. In one lesson she introduces Maggie, a scuba diver who was preparing for a dive in the frigid Antarctic waters. Cowles described Maggie's transition and weight increases as the diver donned her warm layers, a dry suit, ankle and belt weights, air tanks and a regulator. Cowles then asked the students to complete a variety of mathematical equations including converting 1 degree Celsius to Fahrenheit. In another scenario, she asked students to figure out how many brownies the cooks needed to bake to feed 120 hungry passengers from a passing cruise ship and 30 Palmer workers.

"I want students to see a bigger picture with math - have more problem-solving skills," said Cowles. "Math is a daily tool that we use in life, from check-books to science."

Cowles believes her being in Antarctica offers her students an opportunity to improve reading and mathematics, but also to learn "other areas of literacy" such as computer skills and practical knowledge of science, measurements and biology.

"Literacy' also means to apply the materials learned in a broader, functional understanding," said Cowles.

When Cowles is not assigning math problems, explaining the Antarctic Conservation Act or describing Antarctic biology, the food web and daily living, she is collecting air samples for scientists on the Persistent Organic Pollutants (POPs) team, who are studying the impacts of organic airborne pollutants on the Antarctic food web.

Cowles, an advocate of online teaching tools that provide adults with "interesting subject matter" to teach adult literacy, was not even certain that she met the application guidelines, since all previously accepted teachers worked in formal education, grades K-12.

"In my application, I explained that they (the students) are workers, voters, taxpayers, parents and grandparents," said Cowles. "And it's a community that is under-represented."

On the fourth day of class, there were 12 students in Cowles' class. Their ages ranged from 16 to mid-40s. They came from Somalia, Mexico and the U.S. Some wanted to complete the equivalency of a high school degree, others want-

"(The students) are workers, voters, taxpayers, parents and grandparents, and it's a community that is under-represented."

- Susan Cowles, teacher

ed to continue on to college. Their backgrounds, education levels and skills vary widely, and Cowles met with each student to develop their individual study plans.

"I like how nice everyone is," says 16-year-old, Elizabeth Hudgeus of Corvallis, Ore. "It's a non-stressful environment and I can go at my own pace."

Cowles' arguments were convincing and she was awarded one of the eight Antarctic teacher positions available for the 2001-2002 austral summer.

"A teacher has to convince NSF that he or she will benefit the research project and will use the experience to deliver science effectively into classrooms," said Guy Guthridge, NSF's Antarctic information manager, who pairs the teachers with scientists.

The TEA program is a partnership among school districts, teachers and researchers that brings first-hand science to classrooms in the U.S., exposes career possibilities for students and brings science to communities.

Chosen by a panel of TEA administrators, all eight teachers were assigned by NSF to science teams and the three U.S. stations in Antarctica.

"The National Science Foundation's highest priority is to integrate research and education, because improving science literacy is a national need," said Guthridge.

The benefits to scientists, teachers and students are mutual.

"The teacher benefits by getting a dose of reality in how field science works, in learning the latest advances in the topic (beyond what's in the text-

books) and by achieving an authority based on these experiences when back in the classroom...The student benefits from hearing from a better-informed teacher," said Guthridge.

The teachers' experience allows students to see how material presented in class was used by scientists. The students were able to witness the scientific process.

One Antarctic teacher assigned to McMurdo Station, Tina King, taught her fourth graders to conduct their own atmospheric experiment. Her students are taking atmospheric temperature measurements of their area, charting the data and comparing the results to daily temperatures at South Pole and McMurdo Stations.

"My hope is that they will broaden their world and the goals they set for themselves," said King. "It definitely motivated them to 'want' to know more."

According to Guthridge, the students also benefit from having a scientist visit their classroom in person or by e-mail. In addition, the scientists work closely with the teacher, who has a "fresh perspective" from someone in a different field and whose questions about research can often "redefine the way it's done."

Jason Petula of Tunkhannock Area High School in Pennsylvania recently returned to his class from spending six weeks at Amundsen-Scott South Pole Station, where he worked with a team of astrophysicists. Before he went to Antarctica, his team arranged for him to take graduate courses at the University of Wisconsin in particle physics. According to Petula, the education allowed him to gain more specific knowledge about astronomy and participate as a viable member of the research team.

On the Ice, Petula worked fast and furious to allow for researching, teaching and participating in community outreach through interviews with National Public Radio and some newspapers and by answering a flood of over 1,400 e-mails that followed.

With the stations' summer populations starting to dwindle as fall approaches, all but Cowles have returned to their classrooms from Antarctica and many have outwardly expressed personal and professional rewards for their hard work, with only few regrets.

"My only regret about Antarctica is that this is a once in a lifetime opportunity. Now that I have been exposed to the project and Antarctica, I yearn to return," said Petula. "It is like Pringles... you can't have just one."



Photo by Mark Sabbatini/The Antarctic Sun

By Mark Sabbatini

Sun staff

The problem with advances in technology is people want to use them.

That can be a challenge on the Ice, where workers at two of the three U.S. research stations lack full-time Internet access and aging satellites that transmit some data could literally fail any day. Researchers showing up with the latest computers and equipment sometimes have difficulty hooking into station systems that may be running older software.

"Everybody always wants more bandwidth," said B.K. Grant, information technology project manager for the Amundsen-Scott South Pole Station. "The type of research that is done here produces a lot of data that has to be processed."

A number of ongoing or future projects are expected to overcome many of those limits within the next couple of years. The "wish list" of scientists and others working in Antarctica far exceeds what can realistically be provided, but technology personnel are targeting the most vital needs through new purchases and making the most of what's already on hand.

"We've always found intermediate solutions," said Jim Johnson, manager of information technology for Raytheon Polar Services Company.

An upgrade later this year at Palmer Station will provide full-time online service that is nearly seven times faster than the access available now only four to five hours a day. Changes taking place at the South Pole will roughly triple many of that station's data capabilities. Wireless service to field camps may quadruple transmission abilities while drastically improving reliability.

Expanded capabilities are also being discussed for McMurdo Station, which is scheduled to consolidate its telephone and network operations into a new building by 2004. In addition, a variety of network portals serving different Antarctic and mainland U.S. portions of the United States Antarctic Program are scheduled to be consolidated into one portal (www.usap.gov) by next year.

Officials said the changes will do more than just make it easier for people to check their e-mail and update Web pages from the field.

Researchers, for example, may benefit from being able to collect data year-round without making the trip to Antarctica.

"They have to have more personnel on-site because they can't do as much remotely," Grant said.

Critical transmissions such as medical information from outside the continent will be easier to obtain in some instances without worrying about blackout periods. There is, for example, a seven-hour window each day at the South Pole where the ability to handle such data is very limited.

Phil Mitchell, a dining attendant at McMurdo Station, uses one of the public computers in the station services building.

Doing better

"That's a risk we've taken up until now," Johnson said. "The question is do we want to continue taking that kind of risk?"

Some discussed projects aren't likely to be more than fantasy anytime soon. Johnson estimates his department could probably request \$50 million of equipment, not including pie-in-the-sky items such as a fiber optic line to the South Pole that could cost \$100 million. But they only have a \$7 million annual budget, and most of that goes to payroll and related expenses.

"We don't have increasing resources right now, so we've got to do the best we can with what we've got," he said.

Among the first of the coming upgrades is at Palmer Station which, in a way, is trading the equivalent of a modem for high-speed Internet access.

A new satellite earth station expected to be online by Oct. 1 will operate at up to 256 kilobits per second (kbps), or about what a cable modem is capable of under ideal conditions. Palmer's current satellite capability is 38kbps, comparable to standard modems which operate at up to 56kbps.

One thing that won't change is everyone at the station has to share the bandwidth, which can slow access considerably if a few users decide to download large files or listen to live radio stations being "streamed" over the Internet. The same problem of shared access exists at other stations, although so far McMurdo is the only one that has blocked users from such activities during busy periods.

The South Pole gets much of its telephone and data communications capability from NASA and U.S. Air Force satellites that are reaching the end of their orbit life cycle. At that point they become visible from the Pole, so to speak, in highly inclined geosynchronous orbits. Johnson said the satellites are now at a stage where they're far from reliable.

"The birds we have right now are ready to fall out of the sky," he said. "They're all very old."

Those connections to the outside world disappear for 11 to 12 hours a day when the satellites dip out of the station's view, preventing routine Internet and e-mail transmissions during those times. Also, workers are limited to making personal phone calls to the outside world only two days a week during satellite visibility, plus holidays.

A significant boost in data capability and a few more hours of daily accessibility are expected once the new South Pole Marisat/GOES Terminal is fully operational, possibly this winter or next year. The terminal is operating at partial capacity as engineers work out problems in the system, which communicates with the commercial MARISAT- F2 satellite and National Science Foundation's GOES-3 satellite.

Meanwhile, the Pole does have 24-hour access to the outside

Channeling the data stream

By Mark Sabbatini
Sun staff

When a McMurdo recreation department employee wanted to obtain a copy of "Auld Lang Syne" for the station's New Year's Eve party, it seemed a simple enough task.

Plenty of versions are available on the Internet, many of them legally available free for downloading. But clicking on the links resulted only in error messages, forcing the employee to look elsewhere for music to bring in 2002.

The error messages weren't an accident. A series of measures limiting online activity from 7 a.m. to 8 p.m. Monday through Saturday took effect at the station this year, said Jim Johnson, manager of information technology for Raytheon Polar Services Company. He said the station, which often has upward of 1,000 people during the summer, can overwhelm the T1 satellite connection that provides data and voice links to the outside world.

The limits include blocking music sites such as Napster and its clones, and preventing streaming video and audio feeds, Johnson said. Also, information going through McMurdo's data pipeline is prioritized by an automated system, with Internet surfing giving way to things such as e-mail and transmissions of business and medical data.

"If you're slow on the Web there may be a (file transfer) or an e-mail going on that's a priority," he said.

IT officials at McMurdo have tried to speed up access to commonly visited pages such as Yahoo! and CNN by caching some information from those sites locally, Johnson said.

He said the restrictions, enacted for the first time, will end at least temporarily when summer employees depart next month.

"We do relax the restrictions during the winter," he said. "But, if critical operational and scientific data run into congestion problems, IT reserves the right to restore the summer restrictions."

Similar restrictions are likely at Amundsen-Scott South Pole Station next summer, Johnson said. Internet service there is even more limited, with only about 12 hours of access a day possible - often with very slow connections.

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world through Iridium satellite phones, available for business and emergency calls, Grant said. Also, some phone calls to the U.S. are possible through ham radio connections, although others with such radios can listen in. Finally, scientists can send, but not receive, larger amounts of data through the NASA Tracking and Data Relay Satellite System available for about five hours each day.

McMurdo Station gets its phone and data communications through a T1 satellite link, a relatively fast connection, but one that has to be shared by upwards of 800 people at times. Johnson said boosting that capability, possibly with a second T1 or other link, is being discussed with NSF officials, but nothing noticeable to the general population is likely soon.

Instead the primary focus is boosting the technical links to the ice runways and remote camps. Johnson said wireless local area network (LAN) systems have been successfully tested at the Marble Point and New Harbor camps, as well as the Pegasus and Williams Field runways.

"Next year we'll expand its use out to the Dry Valleys to improve connectivity to Lake Hoare and Lake Bonney, as well as some isolated field camps on the sea ice," he said.

The improvement, Johnson added, will be radical.

"Remote camps will see a doubling to quadrupling of their data bandwidth, plus see increased reliability and robustness," he said.

McMurdo's communications operations are scheduled to be relocated to the new Joint Spacecraft Operations Center by 2004. Telephone and computer network operations are now in buildings built during the mid-1960s, where future expansion and proper control of environmental factors such as humidity, dust and temperature aren't possible.

A change potentially affecting all USAP participants is the new www.usap.gov Web portal, which will replace site-specific portals such as www.mcmurdo.gov and www.spole.gov. Johnson said the change will likely go in effect when next year's summer season is over.

"Connections between sites will be a lot faster," he said.

Complaints about phone and computer connections occur regularly, especially when systems break down or are only partially operational, Grant said. But she said it's important for people to remember where they are and view things from a historical perspective.

"We have a lot better communications than we did five years ago when we were doing almost everything by radio teletype," she said.

Continental Drift

What was your most memorable experience of the season?



"Boating in the zodiacs."

Stephanie Such
PhD student at Palmer Station from Southampton, UK.



"Standing atop Mt. Erebus, chucking Erebus crystals back into the caldron of fire from which they came."

Matt Irinaga
Field coordinator at McMurdo Station from Healy, Alaska



"Re-PQing in Christchurch for two weeks."

Alice Orlich
Cargo worker at South Pole from Wiseman, Alaska

Whales

From page 1

taking more than 900 killer whales. They quickly recognized the killer whales came in at least two types, the large and the small.

"So they described a separate species, but their description was ignored," Pitman said.

Pitman believed the Russian whalers thought, at least after more than 10 years on research cruises in Antarctica. He's seen the different whale types and believes there are at least two species.

The large killer whales live outside the pack ice, feeding on minke whales, Pitman said.

The smaller ones are lesser known because they live in the pack ice, where they eat mawsoni and other fish. They are about 20 to 23 feet (6-7 m) long, which is 3 to 5 feet (1-1.5 m) shorter than the regular killer whale.

The DNA samples Pitman is collecting will help determine if the two types of whale are different species, he said. After sequencing DNA from the samples, he'll compare it with DNA from the larger, more common, orcas.

"Somebody already said that they're morphologically and ecologically unique," Pitman said. "The way to ice it is to come down here and do the genetics."

On his National Science Foundation-sponsored trip to McMurdo Sound on the icebreaker *Polar Star*, Pitman came across a pod of about 60 orcas. The crew launched a small boat and he spent three hours chasing the whales down for samples. He came back with nine.

"Sometimes you'll see a flinch or sometimes they'll slap a tail," Pitman said. "This particular group didn't mind at all."

In fact, the whales came closer after he'd sampled them.

But arriving at McMurdo Station Pitman ran into a small kink in his plan. Looking at the whales, and photos of killer whales around the station, Pitman realized there might be not two species of killer whale, but three. A distinctive eye patch and differing school size seemed to further distinguish the smaller killer whales into two groups, which don't intermingle.

"It may turn out that these differences are just like blonde hair and brown hair in humans, or it may turn out that these animals are completely different and don't interbreed," Pitman said.

Since then he's spent several weeks on the icebreakers and spotted about 300 whales. He obtained nine more samples, but hasn't seen the third type of orca.

"They're quite small," Pitman said. "Now that I know that they're different, you just wonder how people ever lumped them together with regular killer whales.



Photo by Jeanne Cato/Special to The Antarctic Sun

Killer whales cavort recently behind the Polar Sea in McMurdo Sound.

To me, it makes killer whales a lot more interesting if there is dietary specialization and more than one species."

The ability to map and compare DNA has allowed scientists to discover more divisions within species than they expected.

In Pitman's work surveying dolphins for the National Marine Fisheries Service out of La Jolla, Calif., molecular genetic evidence from skin samples showed that what had been assumed to be simply variations of the common dolphin was actually two separate species. A similar discovery was made in the tropics with baleen whales, which turned out to be three species instead of one.

"There's easily three distinctive forms of killer whales here in Antarctica," Pitman said.

Because all the killer whales have been lumped together as one species in the past, nobody knows what the relative abundance of the different orca types may be. From 70,000 to 180,000 orcas are thought to live in Antarctic waters, but those numbers are based on surveys of orcas outside the pack ice.

The groups of orcas within the pack ice may be more numerous, Pitman said. The pack ice orcas live in schools of 50 to 100, and even up to 400, Pitman said. The larger orcas outside the pack ice stick to schools of about 10.

"It may be that the majority of the killer whales in Antarctica live in the pack ice," Pitman said. "The important thing is to get these tissue samples and sort out what it is we have there," Pitman said.

DNA doesn't solve all the questions

though. The more different the DNA sequences are, the longer a species has been separate, Pitman said. But if the separation is recent, or just occurring, it can spark a debate over whether or not it's actually a different species.

"There's of course a gray area there in evolution and what you decide is a separate species is arguable at times," Pitman said. "Or even what 'species' is."

The length of time it takes a particular species to evolve from another depends on its speed of reproduction and number of offspring. While viruses mutate quickly, creating new strains every year, whales take hundreds of thousands, even millions, of years to evolve. But conditions might be right for them in the Antarctic.

"There's a lot of prey here and there's a lot of large prey, so maybe that's the kind of situation that allows for speciation of large predators," Pitman said.

About orcas

Killer whales (*Orcinus orca*) are actually not whales at all, but large dolphins.

"They're called a whale just because they're large," Pitman said.

Nor are they particularly vicious killers, though their diet is more varied than most whales. Killer whales tend to be dietary specialists: some feed on mammals, including seals and large whales, while others eat only fish.

Black with white and gray markings, the orca are distinctive. They are most plentiful in polar regions, particularly around Antarctica.



Photo by Mark Sabbatini/The Antarctic Sun

Lauren Scott, left, and John Epstein of Washington University in St. Louis, Mo., discuss their involvement in the TIGER long-distance balloon mission. The data recorder from the balloon, at right, was recovered after a record trip lasting nearly 32 days.



Photo provided by NSBF/Special to The Antarctic Sun

Balloon From page 1

dent and research assistant for the Laboratory of Experimental Astrophysics at Washington University in St. Louis, Mo.

John Epstein, a mechanical engineer at the university who is retiring after 41 years of research involving about 50 balloon flights, said previous flights outside Antarctica were generally no longer than 24 to 36 hours. Data can only be collected during part of that due to the time required to launch and bring down the balloon.

But Epstein said his team's first launch on the Ice appeared to exceed the total of all others in both length and productivity.

"I can say for sure if I talk about balloon flight hours, collectively this is more," he said. "If you want to talk about data, this is more."

High-altitude balloon research projects are common in Antarctica, although this was the only mission to occur this year. Its purpose was to record previously unmeasured abundances of elements in galactic cosmic rays from outside the solar system.

The 5,000-pound balloon carrying the Trans-Iron Galactic Elemental Recorder (TIGER) experiment, a device half the size of a ping-pong table, collected samples from the rays. The rays are subatomic particles that travel through the galaxy at nearly light-speed, apparently propelled by exploding stars (supernovas), and shower the Earth constantly.

Project researchers are studying the origin and makeup of the rays, which are the only matter from outside the solar system, except for interstellar meteorite dust, that can be directly sampled. TIGER measured the amount of 25 elements in the galactic rays.

"This will enable us to determine whether the cosmic ray source is hot or cold, gas or solid," said Robert Binns, the

project's principal investigator, in a prepared statement issued by the National Aeronautics and Space Administration (NASA), which provided the balloon.

The thin polyethylene balloon was launched from McMurdo on Dec. 21 and orbited the continent at an altitude of about 125,000 feet (38,000 meters) for 31 days and 20 hours. Officials have recovered the TIGER data recorder and hope next week to recover the balloon, which measures 555 feet high and 424 feet in diameter when inflated.

One of the project's primary goals was to collect data on elements heavier than iron, including three - bromine, rubidium and yttrium - that have not been sampled before. Scott said the heavier elements are very rare, with perhaps 1,000 of each collected during the balloon mission compared to the millions of lighter elements collected.

Supernovas occur when a star has iron in its core, with the heavier particles created because of the energy released, Scott said. He said scientists have a good idea of what occurs during the first 10 billion years of a star's life, but analyzing the heavy particles might provide more information about the end process and what happens to the particles during their journey.

TIGER researchers hoped to launch the Long-Duration Balloon (LDB) in early December, but unfavorable weather conditions forced them to wait. The weather would work in their favor, however, when some problems developed that had officials debating whether to bring the balloon down after its first 13-day orbit.

The health of the balloon was a concern as it completed its first orbit, said Dave Sullivan, LDB site facility manager for the National Scientific Balloon

Facility (NSBF), an agency of NASA. He said NSBF has a set of criteria to determine if the balloon should remain airborne and "we had made a decision on-site to bring it down" for a number of reasons.

"Some of them were the health of the balloon, the altitude it was floating at," he said. "It would come up to a reasonable attitude, but never full altitude."

Other reasons included indications of a possible problem with the parachute cut-away and minor holes in the balloon, although "quite often" the balloons are able to fly with such holes, Sullivan said.

However, NASA officials at the agency's Goddard Space Flight Center on Wallops Island, Va., decided to keep the balloon aloft for a second orbit. Epstein said one of the factors was bad weather that would have hampered efforts to recover the payload.

Completing the second orbit was a top priority of TIGER researchers, more so than recovering the data recording equipment, Epstein said. He said virtually all of the critical data was transmitted by satellite during the voyage, although there were several hours of gaps when information was not received.

The previous mark for an LDB flight occurred in January of 2001 when one orbit of the South Pole lasted 26 days.

TIGER researchers are hoping to launch another LDB flight in two years to sample cosmic rays under different solar conditions, Scott said. He said the sun goes through an 22-year cycle where solar activity goes from minimum to maximum and back again, with the most recent maximum reached in 1999. High solar activity floods the solar system with particles,

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READING THE ORIGINS OF ROCK

By Kristan Hutchison

Sun staff

The mountain view across McMurdo Sound is just a pretty picture to most people who see it, but to geologist David Elliot the quiet peaks are full of stories.

They speak of molten rock, past explosions, rupturing of the Earth and a journey of more than a thousand miles underground.

The chapter Elliot is currently trying to interpret is written in the black bands of rock that run through the range, giving the peaks a layered look. Those rocks, called diabase sills, crystallized from molten rock during the breakup of Gondwanaland 180 million years ago, Elliot said.

Elliot believes the molten rock originated in the Weddell Sea region and flowed for some 1,900 miles (3,000 km) through tunnels 6 to 12 miles (10-20 km.) underground in a rift that paralleled the Transantarctic Mountains.

"The diabase sills and related lavas have an unusual and distinctive geochemical composition, including the isotopes ratios of certain elements," Elliot wrote.

The unique geochemistry appears in separated diabase sills and lava outcrops scattered over 1,400 km, from north Victoria Land to the Beardmore Glacier region. Because of the complexity of the process that must have formed them, Elliot said it makes sense for the disbursed rocks to have been formed from a single source, most likely the Weddell Sea where the breakup of Gondwanaland began.

Although it's a long way for molten

rock (magma) to travel, there is good evidence a similar event took place in northern Canada, where magma flowed 1,553 miles (2,500 km) underground, Elliot said.

"If it occurs one place in the world, why shouldn't it occur someplace else?" Elliot said.

The molten rock rose to the surface in two ways, sometimes as lava flows and other times as explosions that formed fragmental or pyroclastic rocks.

"The pyroclastic rocks are mainly made up of coarse fragments, which may be more than a meter across, floating in a fine-grained matrix," Elliot said. "It looks like raisins in dough, just randomly distributed."

In this case the raisins, or fragments, are a mix of crystallized magma and sedimentary rock formed in an explosion when the 1,800F (1,000C) magma struck groundwater, instantly turning it to steam.

"The explosions fragment the sedimentary rocks, and both chill and fragment the molten rock," Elliot said. "The steam-particle mixture then rises rapidly to the surface."

One particular kind of pyroclastic rock, tuff-breccia, exists in the Transantarctic Mountains in quantities unknown anywhere else in the world. In Allan and Coombs hills the tuff-breccia is up to 1,300 feet (400 m) thick and covers almost 10 square miles (25 sq. km.). It's about 10 times as large and deep as any found elsewhere, Elliot said. In other parts of the world, tuff-breccia is typically found in layers two to three meters thick and

extending over a few square kilometers around volcanic cones.

"In examining records of volcanic rocks around the world there's nothing on this scale known so far," Elliot said.

He is trying to determine how and why the tuff-breccia deposits formed. This summer he spent a month in the hills, looking for clues.

Two theories compete to explain how such extensive deposits formed. One theory holds that the tuff-breccia is a local phenomenon, in which the pyroclastic rocks filled a huge crater.

"In essence it's filling up a hole in the ground and the hole in the ground was actually formed by the volcanic process," Elliot said.

The other theory, the one he prefers, is the pyroclastic rocks flowed like mixtures of mud and blocks from volcanic centers and filled the ancient topography.

"We went to the field to try to figure out which one is right, or if neither is right then propose a third alternative," Elliot said.

"We found the geology to be quite different from what had previously been reported," Elliot wrote after he returned. "Furthermore, the rocks have some characteristics of both theories for the origin of the tuff-breccia deposits."

Elliot went home with seven boxes of rock samples. He and his team will examine the rocks under the microscope, examine polished slabs, process some samples for pollen analysis and analyze some samples for geochemistry.

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which blocks some of the particles from elsewhere in the galaxy from reaching Earth.

In two years there will be less solar activity and "a 30-day flight will yield more data," Scott said.

Epstein said one of the highlights of his lengthy career is the design of the TIGER telescope, which uses a scintillating fiber hodoscope to take particles coming from all angles and provide data as if it were

coming from a straight trajectory. By doing so, it is possible to identify similar particles that might otherwise be confused with each other.

It took about five years to develop in-house the technology for the 5,000 square scintillating fibers used in the hodoscope, Epstein said. But among the rewards is an increase in collaborative projects with organizations outside the university using the device.

Epstein may not necessarily be involved with those projects or subsequent TIGER flights, however, as he is 65 and ready to retire. Sullivan, the LDB site manager, in evaluating the just-completed TIGER flight, said "I just think it's been a wonderful high for him to retire on."

But Scott suspects he hasn't heard the last from Epstein.

"The chair's not going to stay cold, I think," he said.



Profile

Story and photo by
Melanie Conner
Sun staff

Moving on: Jensen trades the dome for a home



Katy Jensen, the first female area manager at South Pole Station, will retire her position this year, but says that her Antarctic career is not over.

environment,” Jensen said.

During her second year in Colorado, Katy found her way to a boat through a “Sea Semester” university-sponsored program in Woods Hole, Mass. Jensen learned basic oceanography, biology and ship-handling skills, read maritime literature such as *Moby Dick* and visited maritime museums. The second half of the semester was spent collecting blue-green algae in the Caribbean Sea aboard the 100-foot staysail schooner *R/V Westward*.

After college, Jensen returned to the sea. She joined the NOAA Corps, where she learned emergency medicine and diving skills such as underwater equipment repairs. She also learned about coordinating science and logistics, and learned to captain a ship.

“It’s an awesome feeling to have command of the ship at 3 a.m. when the captain sleeps – your decisions matter,” said Jensen.

After two years of shipboard mapping and surveying in the Gulf of Mexico, her work with NOAA led to her 10-year Antarctic adventure of summers and winters at 90 degrees south latitude.

“Being at the Pole for me is a lot like being at sea... frozen waves, no place to run, life is dependant on a generator,” wrote Jensen.

In her previous Antarctic deployments, Jensen has stayed in one-year increments. Last summer as area manager was her first time spending only a summer on the Ice.

“When the summer ended I didn’t want to go,” said Jensen. “Winters are magic – I always thought the reason to work summer is so that you can experience winter.”

Jensen has left the Pole many times, but she said Feb. 15 this year, when the last airplane leaves the South Pole for the summer, will be especially hard.

“I have a little tradition (when I leave) to walk around and say goodbye to the place,” said Jensen. “I know it didn’t feel right the last time, but I wanted to do it anyway – just in case.” ■

As summer leaves Antarctica, so does another long-time friend to many – Katy Jensen.

“She is the best station manager we’ve ever had,” said Rich Boehne, director of operations for Raytheon Polar Services Co. She has changed the attitude of the station. We don’t know how she did that, but we’re trying to tap it.”

Jensen has cheered the people at Amundsen-Scott South Pole Station for several seasons with what is described as a friendly, unassuming and calming attitude.

“She’s fantastic – the best boss I’ve ever had,” said Alex Brown, South Pole assistant area manager, “She’s the ‘good cop.’”

Brown described Jensen as an excellent listener and one who will set everything aside to listen to an office visitor, even when she’s busy with “days and days of work.”

“Every day she writes in her journal. Everything and everyone is recorded,” Brown said. “She could tell you the day that so-and-so tripped and fell.”

Jensen started working at Amundsen-Scott South Pole Station as a grantee for the National Oceanic and Atmospheric Administration (NOAA) in 1992, when she bottled clean air and snow, and sent the samples off to universities and research centers for further analysis.

She enjoyed the simple, but strict process: Walk up into the clean air sector, exhale and hold the next breath. Then walk a pre-determined number of paces to collect the sample.

“At first it was really hard to hold your breath,” Jensen said.

Ten years later, Jensen can exhale a long sigh of relief as she will soon bid farewell to her job as South Pole Station area manager. Unlike previous seasons, this time she will leave the aluminum dome without plans of returning.

“I can’t wait to see what’s next,” said

Jensen. “I’ve got lots of big ideas, I just have to make some of them work.”

She is looking forward to return to her husband Rod in St. Paul, Minn., who she met on the Ice at the end of her first season in 1992 and married in 1996. The couple is remodeling Rod’s 1923 childhood house and planning to make-it-rich by selling banana smoothies and BLTs on-a-stick at the Minnesota State Fair

“Rod’s doing most of the work by himself,” wrote Jensen in an e-mail. “I just show up occasionally to sling a hammer or choose paint colors.”

Jensen and her husband have only one dependant - a “hockey-playing, toothless” Australian blue heeler, Zubov or “Z.” According to Jensen, Z, who was named after a Russian hockey player for the Dallas Stars, is not really “toothless – just vampire-ish, missing his front teeth from a puppyhood accident with a neighbor kid’s baseball bat.”

Jensen, the youngest of eight children, has always been an adventurer. Raised in a family of sailors in Annapolis, Md., she grew up boating and swimming in the Chesapeake Bay.

Although her father was the dean of admissions at the U.S. Naval Academy, she wasn’t sure she even wanted to attend college. Eventually her father encouraged her to attend Colorado College, a small liberal arts school in Colorado Springs, where she studied biology, theater and directing.

“He knew that I would thrive in this