

The Antarctic Sun



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Antarctica from Above

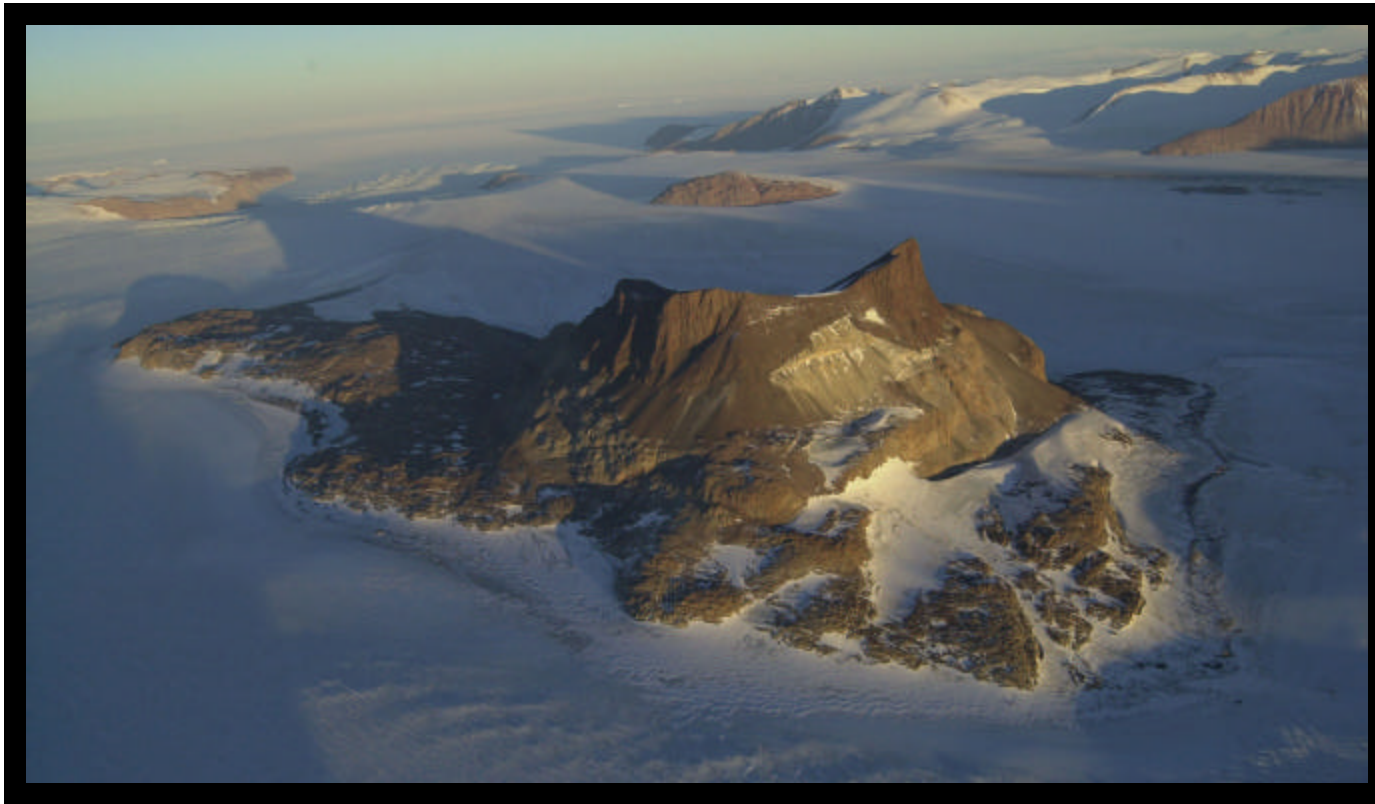


Photo by Yann Arthus-Bertrand/Special to *The Antarctic Sun*

The 10 p.m. twilight glints off Mount Suess, as seen from a helicopter hovering over the Mackay Glacier north of McMurdo Station. This photo was taken by Yann Arthus-Bertrand, an Antarctic Artist and Writers grantee this season. For a better view of his photos, see a full-color version of *The Antarctic Sun* at www.polar.org and at his website, www.yannarthusbertrand.com. Turn to page 11 for more photos and page 12 for a profile of the photographer.

Chip off the red planet

By Emily Stone
Sun staff

The Antarctic meteorite hunters knew they'd found something good when they spotted the crusty black rock on a Miller Range ice field last year.

"The field notes said, 'this is very, very, very sexy.' Three verys," said Ralph Harvey, head of the U.S. Antarctic Search for Meteorites program (ANSMET).

The hunters had to wait months before learning what they had discovered. The fist-sized rock first had to be



Courtesy of Ralph Harvey

A Mars meteorite found last season.

carefully collected by the 4-person team, shipped frozen to NASA's Johnson Space Center in Houston, and then split so that a small chunk could be sent to the Smithsonian Institution for analysis.

In July, the team learned they'd found a piece of Mars.

The piece is a 1.3 billion-year-old volcanic meteorite, weighing 715 grams.

Martian meteorites are rare finds. Eleven of the 31 known Mars meteorites

See Mars on page 8

QUOTE OF THE WEEK

"Antarctica is made of chocolate and marshmallows."

- Woman admiring photos of ridges rising from the snow near the Dry Valleys.

INSIDE

Lava holds clues to magnetic flip — page 7

Ground ozone plays hide and seek — page 9

For those leaving the Ice, it's ...

A fresh, wonderful world

By Kristan Hutchison
Sun staff

Frank Thompson smelled grass and trees before his plane even landed in Christchurch, New Zealand.

"It's amazing how tuned your senses are," said Thompson, three days after returning to Christchurch from his fourth winter as an aircraft ground equipment mechanic at McMurdo Station.

A heightened sense of smell is just one of the changes people deal with as they adapt to life after a winter in Antarctica. Months of isolation also leave them highly sensitized to sound, light and people. Suddenly they are doing things they haven't for seven months, including driving and paying bills. It takes some adjustment, but after seven months or longer on the coldest, driest continent smelling nothing but diesel, food and humans, most relish their return.

"The best thing about going to the Ice is leaving," said Thompson, who plans to return for another winter in January.

On the flight to New Zealand he felt the humidity in the air while the plane was still several miles from Christchurch. Walking down the street after landing he sensed a strong whiff of flowers and fol-



Kristan Hutchison / The Antarctic Sun

Just three days after leaving a winter in McMurdo, Tom and Lynn Hamann prepare for their next one by having their tuberculosis skin tests checked at a Christchurch hospital as part of the physical.



Frank Thompson, left, shares a beverage with fellow winterers at Bailie's, a favorite watering-hole for people returning from Antarctica.

Kristan Hutchison / The Antarctic Sun

lowed the scent for 40 meters before finding the flowerbed.

Renee Magyar was on the same flight and rejoiced in the rain that greeted her when she stepped off, the first she'd felt in a year.

"Everything was so fresh and moist. There was a slight rain when we landed and it was a lovely feeling to have rain on my face," she said.

In the morning she was excited to see a cat at the hotel and ducks swimming on the Avon River, the first animals she'd seen in 12 months.

The winterers also are hyper-sensitive to noise and people. The sound of birds singing woke Lynn Hamann at 3 a.m., so she woke her husband, Tom, to hear it, too.

Two months after returning to the "free world," Traci Fisher is still so in awe of the beauty and colors in nature she sometimes becomes teary eyed while running in the park in Manchester, England, where she is now.

"I just don't take the beauty in nature, especially all of the colors, for granted like I used to," she wrote.

Surprisingly, though they just spent months in temperatures -40C and below, many winterers wind up shivering in Christchurch's damp spring weather.

"You'd think you'd be acclimated to all of that," Thompson said. "I think it has to do with the humidity."

Used to dining in a cafeteria night after night, the returning Ice people indulge their cravings. Tom Hamann went straight for a crisp iceberg lettuce with creamy dressing. Matt Miller immediately bought an apple and four oranges. Fisher spent

hours in cafes drinking coffee.

Thompson's first night back, he walked through Christchurch streets with his friends making a mental list of all the kinds of food they wanted to eat — sushi, Thai, Mexican. ... They've checked off quite a few since, though he almost walked out of a restaurant without paying — a classic mistake for winterers who haven't needed money for seven months.

"The reality hits too when you remember you've got to pay to do your laundry," said Tom Hamann.

Remembering to pay can be easier than remembering how to drive, especially on the correct side of the road. When Fisher first arrived in New Zealand she rented a car for a 10-day road trip — in the left lane.

"I scraped along a few curbs and got honked at a few times while going through roundabouts," Fisher said. "But it was great to be on the road again."

While they revel in the food, smells and freedom, winterers also become frustrated by waiting in lines and dealing with so many people. Fisher found she's more irritable in crowds.

"You notice when you come back off the Ice how much time we spend waiting in traffic and waiting in line and things that I just consider a waste of your life," said Lynn Hamann.

Thompson sometimes slips away to his hotel room or the Botanical Gardens for some quiet, but like many of the winter crew, he's headed somewhere even better.

"This time next week I'll be in Fiji," Thompson said. "I think anyone can adapt to that."



Perspectives Perspectives

Discovering new days in the long night

By Peter Rejcek

A friend of mine who previously wintered at the South Pole imparted these words of wisdom shortly before he got on the plane at the end of the 2003-04 summer:

“Pete,” he said, with deadpan seriousness, “wintering at the South Pole won’t be the worst mistake you ever make, just the longest.”

I must admit there have been days here when his words came starkly to mind. Like reading tea leaves at the bottom of a cup, I would look at my cracked and bleeding hands, starved for moisture, and see a dismal and endless future of cold, darkness and drudgery. Only a few months before I came here I had been diving on some tiny islands off the east coast of Malaysia, contemplating life as a dive bum for the next few years.

But now, as I write this, outside my window there is an orange and golden sliver on the horizon, auguring the return of the sun, and casting a new light on the winter.

I’m reminded at a time like this of the French existentialist novelist and philosopher Albert Camus. In his famous essay “The Myth of Sisyphus,” Camus draws a very important lesson from a condemned man. Sisyphus was an ancient Greek king, banished to Hades for a crime against the gods. His punishment was to roll an enormous boulder up a hill every day, and after reaching the top, the rock would tumble back down the hill. Sisyphus would then repeat his task ad nauseum.

Camus drew a parallel between the myth and the drudgery of everyday life (not to mention the endless six-month night at the South Pole). He posited that at the moment when Sisyphus was at the hilltop and before he returned to the task of retrieving the boulder, there was a fleeting moment of transcendence — when a person is at the pinnacle, and for however briefly, can rest a moment and see the vastness and value of life before him.

That’s life at the South Pole.

Most days start around 6:20 a.m. for me. Out of bed, grab a bagel and off to the computer lab to read an electronic copy of *The New York Times Digest*. The rest of the day is even more regimented: Begin work at 7 a.m. and keep at it until 9:30 a.m., break; work until 11:30 a.m., lunch; back to work



Photo by Andrea Dixon / Special to *The Antarctic Sun*
Peter Rejcek outside the elevated dorm (left).

at 12:30 p.m. and work until 2:30 p.m., break; and then back to work until 5 p.m. Three days out of the week I go to the gym, where I ride the stationary bike to nowhere, though I’ve probably put on enough miles to cycle to McMurdo and back.

The evenings are mainly spent reading and watching movies and surfing the Internet (though with the changing satellite times, the latter pleasure is now mainly reserved for the weekends). I sometimes wonder how people wintering at the South Pole ever survived here before the Internet, and certainly no one outlasted the long winter night without watching scores of movies on worn-out VHS tapes and scratched-up DVDs, right? After a winter here, my knowledge of the cinema is second only to Roger Ebert’s.

Sundays are rarely less disciplined than the weekdays. We get up for our 9 a.m. movie — a particular highlight was discovering a Beta copy of that garish 1960s cartoon version of “The Hobbit” — in the library and drink coffee until we reach a caffeinated nirvana. More surfing, more reading, maybe the gym, martial arts class, cribbage, movie and bed.

Then repeat.

But then there are moments that shake you out of your routine, that remind you that perhaps only a thousand other human souls out of the billions that have lived and died have ever experienced this particular spot in the dead of winter.

One of those moments occurred when the temperature first plunged below that

magical threshold of -100F (-73C). That happened June 7, though only for a few minutes. It seemed inconceivable, almost horrific. How could you survive out there, even with every stitch of extreme cold weather gear available? A few Polies, the vanguard, joined the 300 Club that day. I thought it wasn’t for me.

Yet a few weeks later, on a long weekend, the temperature once again plunged and perhaps the greatest membership drive of the 300 Club began. I remained adamant against joining, yet that evening against all better reason, I found myself completely nude and in the sauna with four other guys, cooking ourselves in that little oven at about 200 degrees Fahrenheit. Finally, unable to stand the heat anymore, we made our dash to the Geographic Pole and into one of the world’s most exclusive clubs.

I can’t honestly say I experienced at the time the sort of epiphany Camus believes his protagonist Sisyphus undergoes. My goals were far more modest: reach the pole and return to the dome before losing any vital extremities. Only after the ordeal was over, talking about it with all of the other Polies, hacking the bitter cold out of our lungs and warming frostnipped ears, did I find myself on that pinnacle. There I didn’t find isolation, but rather a community that I finally felt a part of in a way you never can in Dallas or Boise, Idaho. I finally understood, if just below the surface and briefly, what it meant to be here.

There have been other moments, though even more brief and ineffable: my first auroora that shimmered like a green drape in the breeze; looking out on the moonscape of the ice plateau and knowing this is the closest I’ll ever come to outer space; and meeting and making friends who have lived in mud and straw huts in Kenya or biked their way across America.

There is a rather annoying minstrel in “The Hobbit” cartoon who sings a ditty throughout the movie in a wavering voice. It begins, “The greatest adventure is the one that lies ahead.” But we don’t understand those adventures until a new day has begun.

Peter Rejcek wintered at South Pole Station. He has written for The Antarctic Sun and Kwajalein Hourglass.

around the continent

PALMER

Summer begins ...

Kerry Kells

Palmer correspondent

After a smooth crossing of the Drake Passage, the *Laurence M. Gould* arrived at Palmer Station on Oct. 3. The last ship had departed Palmer June 2 with the remaining summer scientists and crew. The pancake ice we passed on the way down was a precursor to the station's situation. Surrounded by thick ice and snow, Palmer Station was a mere few buildings in a blanket of clean snow with no open water in sight. Thick snow covered Arthur Harbor on our north and Hero Inlet on our south. Sheathbills, Elephant and Crabeater seals had already arrived at station.

The wintry weather continued this past week, with gusts to 100 kph and 10 cm of snow falling. Open water could be seen past the islands in front of the station with a huge tabular iceberg on the horizon. Snow and wind are not unusual to Palmer Station, but warm weather is common during the austral summer months.

It was a busy five day port call with pallets of new science equipment, station material, station refueling, mail and freshies. Seven people departed station, but the population grew to 32 with summer personnel. Two scientists also arrived at station: Brett Pickering with Bill Fraser's Long Term Ecological Research (LTER) in penguin and seabird research and Ryan Said with Umran Inan's Very Low Frequency group.

On Oct. 13, Said, a graduate student at Stanford University with the Department of Electrical Engineering, gave the science lecture on his work titled "Lightning, the Sun, and Aurora: Where Palmer Fits In."

His research studies global thunderstorm activity, its affects on radiation belts and the lower ionosphere. Said explained the layers of the atmosphere and the ionosphere, the Earth's magnetic field, solar wind and the data collected at Palmer Station. With an audio sample, we listened to the clicks of radio atmospheric emissions by lightning strikes and the whistles of lightning-generated "whistler waves."



Photo by Ryan Said / Special to *The Antarctic Sun*
Palmer people guard against unwanted intrusions of the mind while poking fun at visiting scientist Ryan Said whose project uses groups of antennas to study auroras. It's said some people near a station in Alaska wear aluminum foil hats fearing radio waves are having some influence on them.

His research group collects data from around the world. Inan's program maintains a buoy that collects data from the South Pacific Ocean, several hundred miles southeast of New Zealand. The research is also linked to the HAARP facility (High Frequency Active Auroral Research Program) in Alaska where some local residents believe the mass of antennas is the government's attempt to read their minds. They protect themselves from possible "mind reading" and "mind control" by wearing tin hats. In appreciation of Said's science lecture, he was greeted at dinner the next day with a variety of aluminum foil hats to protect against mind control.

SOUTH POLE

... winter's nearly over

By Peter Rejcek

South Pole correspondent

What a long, strange trip it's been.

The winter of 2004 is nearly over at the South Pole, and the sun once again is circling the horizon in its slow ascent toward summer. That means it's time to start polishing the good silver — and finding the rest of the silverware — because company is coming.

Preparation for the incoming summer crew, which will reportedly top out at about 240 people as early as mid-November, start-

ed in late September and really picked up steam the first week of October.

At the top of the prep list is the skiway, with the seasons first flight scheduled for Oct. 23. Operators Jake Speed and Rob Shaw started leveling the skiway in early October, and then began grooming it. The process takes many days, and a week's worth of work can be lost in a single storm.

The utility crew of Slay Harwell, Nick Buchinger and Moe Madding are on the front lines of readying the outlying buildings, like the Jamesways in summer camp. Among their responsibilities, the utility technicians must fire up the furnaces and make the buildings accessible by the time the winter population moves out to summer camp. That happens in the last week before summer to make room for the new crew.

The cargo/materials department is also preparing for the arrival of summer. Dehlia Sprague, South Pole materials supervisor, and her crew will prepare the do-not-freeze storage area for incoming freshies and other perishables, restock the janitorial arch and dome for the summer crew and stage the flight line for outgoing cargo before the first plane arrives, among other work.

Speaking of supplies, the biggest winter crew ever at the South Pole has put quite a dent in the food stores. Sprague estimated

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week in weather

<p>McMurdo Station: High: 16F / -9C Low: -13F / -25C Max. sustained wind: 29 mph / 47 kph Windchill: -47F / -44C</p>	<p>Palmer Station: High: 39F / 4C Low: 7F / -14C Max. sustained wind: 45 mph / 73 kph Windchill: -9F / -22.8C</p>	<p>South Pole Station: High temp: -48.3C / -54.9F Low temp: -58.3C / -72.9F Peak Wind: 24 mph / 39 kph Highest Physio: 10,916 ft / 3,341 m</p>
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her crew transported about 450 kg of food a week from the dome to the new station, for a total of more than 14,500 kg of food for the winter. The crew also moved almost 25,000 kg of food from the outdoor storage berms into the dome, with the help of Shaw.

“Yes, we are big eaters here at Pole,” she said.

At the other end of all those numbers is Dan Naber, the South Pole waste management specialist. Not including the waste generated by Facilities, Engineering, Maintenance and Construction (FEMC) the community produced about 19 metric tons of food waste, more than 2 metric tons of glass, 4 metric tons of burnables, 4.5 metric tons of cardboard and more than a metric ton of aluminum. It will take about 25 flights to remove all that waste, Naber said.

“As long as we have enough people and time, it should be flown back (this) summer,” he said.

Though the list of work to accomplish before the summer’s first flight was long, construction will continue unabated until each member of the FEMC crew redeploy. It’s been the biggest construction winter ever at the South Pole, with about 45 people out of the 75 wintering working for the department, according to Carlton Walker, FEMC manager.

Building pods B1 and B2 will be complete when the first plane arrives, except for some flooring, some minor work and installing furniture. Communications areas on the first floor of B3 will be ready for cable work this summer, added Walker, also known to everyone as C-Note.

The biggest challenge of the winter for FEMC was getting materials in and out of the new station, especially in July, the second-coldest month ever on record for the South Pole. FEMC burned through the materials as quickly as they came. Naber said the winter crew produced about 50 metric tons of non-recyclable waste, 6.5 metric tons of cardboard, more than a metric ton of plastic, 9 metric tons of light metal and 44 metric tons of wood debris.

Though a veteran of 16 seasons with the polar program, this was C-Note’s first winter at the Pole. Of the experience, he said,

“If I had to do it all over again, I wouldn’t do anything different.”

While a prodigious amount of work was accomplished this winter, there is still much to do before the new South Pole station is completed in 2007. One can get a sense of what’s still left to do by looking at the whiteboard in C-Note’s office — filled end to end with notes like a physicist’s chalkboard full of formulas trying to unravel the chaos theory, uncertainty principle and theory of relativity all at once.

An even larger winter crew of more than 100 people, about 70 of them working for FEMC, will eclipse this year’s record population to make one last push toward the 2007 final construction goal.



Photo by Peter Rejcek / Special to *The Antarctic Sun*
Angie Rutherford inscribes her name on the 2005 South Pole geographic marker Oct. 1, as Allan Day looks on. Day spent about 60 hours working on the new marker, which is made of bronze and copper. Dehlia Sprague designed the marker, which will be officially unveiled Jan. 1. At left, carpenter Dave Nastrom glues down vinyl for flooring in a closet in Pod B2 in the new South Pole station.

“It’s going to be huge,” C-Note said of the 2005 winter.

A six-day workweek throughout the winter kept everybody busy, but some found the time to do more, like Naber and Sprague.

Naber, from Alaska, pitched in to help with snow removal and skiway grooming. Most mornings he can be found in the kitchen dish room helping clean breakfast dishes. But it’s the chance to get back into a Caterpillar tractor that excites him.

“I’ve been looking forward to it for months. I love driving,” he said. “I had an awesome winter. Ever since I got into the program I’ve wanted to winter here.”

Sprague, who also has wintered at Palmer Station, frequently lent her culinary talents to the kitchen. She cooked gourmet meals and kept the FEMC crew well fat-

tened with chocolate chip muffins. And along with plumber Frank Garcia, Sprague helped ensure many Polies didn’t look too scruffy by offering free haircuts.

Sprague was certainly one of the Polies who carried on the long tradition of volunteerism here.

“No matter how spectacular the auroras or how extreme the weather is, it is really the people that we live and work with that make the winters here at Pole so unique and special,” she said.

— *Angie Rutherford contributed to this report*

SHIPS

Nathaniel B. Palmer

Compiled from reports by Karl Newyear

The research vessel *Nathaniel B. Palmer* left Lyttelton, New Zealand around midnight on Oct. 12. It took a couple days for people to get their sea legs, and the crew was treated to snow flurries on the morning of Oct. 15th.

Beginning that day, researchers started conducting hourly measurements of the water temperature at different depths, which continued nearly flawlessly through the rest of the week. Researchers also got good data on the ocean currents.

The ship crossed an oceanic front on Oct. 16, which was demonstrated by a 4C drop in the surface water temperature. The number and variety of seabirds seen from the bridge dropped correspondingly. The whale observers have yet to make a confirmed sighting, though not from lack of trying. The next day, the *NBP* crossed over 60 South latitude and arrived officially in Antarctica. The ship, headed toward Mertz Glacier, shifted its course a little to the west based on recent ice images.

As of Oct. 18, no whales or sea ice had been spotted. The barometer was dropping and winds and seas were picking up. The crew hopes to be inside the ice edge soon.

Laurence M. Gould

Compiled from ship reports

The research vessel *Laurence M. Gould* recently returned from annual maintenance in Louisiana, where the ship managed to miss being hit by four hurricanes. *The Gould* returned to work at the end of September and is currently dropping off penguin researchers at Copacabana Field Camp before continuing on to Palmer Station.

The ship arrived in Punta Arenas in September through wintry rain, snow and wind, “a far cry from the heat of the Gulf,” wrote marine projects coordinator

Antarctic lava holds record of magnetic field

By Brien Barnett
Sun staff

Paleomagnetist Lisa Tauxe has a bet with a colleague, but already knows she won't collect on it.

Perhaps 500 years from now if the Earth's magnetic field holds steady and doesn't reverse polarity, her heirs may receive a token treasure. Meantime, she's trying to learn more than she already knows about the invisible but real magnetic field that encircles and moves through the Earth.

Last season, Tauxe, of Scripps Institution of Oceanography and author of "Paleomagnetic Principles and Practice," and three other researchers dotted the Ross Island area with 70 sample sites, eventually drilling some 700 rock cores. The basalt flows they sampled date back 1 million to 5 million years. The team cored at sites including Hut Point, Cape Crozier, Cape Barnes, Taylor Valley and the foothills of the Royal Society Range.

"We didn't have a single day to spare," she said Tuesday by telephone. "We got the 70th one and looked at each other and said, 'We're done.'"

Locked inside the stone-cold lava flows of the Mount Erebus region are clues to the age of the flows and changes to the magnetic field.

The Antarctic collection is one of a number of sites worldwide that are being investigated and analyzed to determine characteristics of the planet's magnetic field.

Other sites include Chile, the Azores, Costa Rica, Arizona, Idaho, Alaska, Australia and the far north near Spitsbergen, Norway. Well-dated lava flows are key to this research because regular volcanic eruptions provide records of the Earth's magnetic field.

As that lava cools into solid rock its



Photo by Lisa Tauxe / Special to *The Antarctic Sun*
Jasper Konter prepares to drill a core sample in a basalt lava flow in the Ross Island region. The plastic sheeting protects him and his clothes from water and glycol used in the drilling process.

components begin to align with the magnetic field. Once fully cooled, the rock locks in this record. Flow after flow begins to reveal a history of the magnetic field and may reveal when the field changed polarity or otherwise was different than it is today. Scientists have shown that flips occur at random, the last one being about 800,000 years ago.

Back in the lab, Tauxe and a graduate research student will coax clues from the rock in a delicate, labor-intensive process. They will heat and cool the samples in stages — to temperatures as high as 580 degrees Celsius and back again — until the scientists detect both the direction and intensity of the magnetic field at the time. Other researchers will determine the age of the rock using radioactive isotopes.

There are several reasons to study magnetic history, Tauxe said. Because the magnitude of the field has dropped substantially during the last few thousand years, some wonder whether it is headed for a reversal, or flip. By studying how the

field behaves normally, Tauxe said scientists can understand better the likelihood of it changing.

The magnetic field shields against harmful cosmic rays from the sun and affects telecommunications equipment. But modern researchers and companies have little to go on to predict major changes in the field.

"It's no enormous health hazard," Tauxe said. "But (if the field changes) solar storms could be more severe and communications could get messed up."

Tauxe, who started working in paleomagnetism in 1977, said she believes the record in the rocks will reveal some of the answers to questions such as:

- What is the structure of the average geomagnetic field? And,
- Why does the magnetic field reverse?

Her questions are not new. In the 1600s, William Gilbert looked at records of sailors who used the magnetic field for navigational purposes to make his hypothesis likening the field to a bar magnet. It's similar to when iron filings are placed on a sheet of paper next to a bar magnet. The filings align to the current and form a pattern of wide arching curves radiating from north to south on each side.

Modern research has been conducted since the 1950s. The differences in today's research, Tauxe said, are the vastly better laboratory methods and tools to obtain information about the magnetic field from samples. The goal is to establish a baseline of prediction for the next 200 years or more.

"You have to find out what it does on average to figure out whether it's unusual," Tauxe said.

And when she does, she may be able to collect on that bet.

National Science Foundation-funded research in this story: Lisa Tauxe, Scripps Institution of Oceanography, <http://sorcerer.ucsd.edu/index.htm>

Continent From page 6

Steve Ager.

The Drake Passage calmed down for the *Gould's* first passage of the summer season. But sea ice slowed its progress to Palmer Station and interrupted some of the water temperature measurements, as ice broke the wire holding the sensor.

The *Gould* arrived at Palmer Station around 9 a.m. Oct. 3 to find the pier coated with ice from recent rains. Tying up took several hours. Then the containers on the pier had to be chopped free of ice before anything was unloaded. After five days of unloading cargo and fuel, the *Gould* headed

north again on Oct. 8.

The voyage north through the Gerlache Strait and then west of Brabant Island was spectacular, but winds remained high, gusting to 107 kph.

The winds and seas forced the crew to draw the first two water samples with a submersible pump, rather than launch a sensor off the back deck.

The seas calmed on the final day of the voyage and several seasick passengers emerged from their cabins for their first real meal in days, wrote marine projects coordinator Andy Nunn.

After four days of reloading and collecting new passengers, the *Gould* was at sea again, following the familiar route south.

OTHER NEWS

RPSC contract extended

Raytheon Polar Services Company will continue providing support services for the U.S. Antarctic Program through 2010. The \$546 million, five-year contract extension runs from April 2005 through March 2010.

Raytheon's initial contract began in April 2000 as five-year contract with an option to renew for an additional five years. Raytheon provides science, operations, maintenance and communications support for the National Science Foundation's U.S. Antarctic Program.

Mars From page 1

were found here.

This meteorite is particularly valuable because it belongs to a group of Mars meteorites known as nakhlites. This is the seventh nakhlite on record. All the nakhlites are believed to have come from the same volcanic event and are among the oldest known rocks from Mars. They are named after the Egyptian city of Nakhla, where the first meteorite of that type was retrieved in 1911 after, as legend goes, fragments struck and killed a dog there.

The older the rock, the more it can tell scientists about Mars' past, explained Harvey, a geology professor at Case Western Reserve University in Cleveland.

"The rock has potentially recorded not only a volcanic event 1.3 billion years ago, but all of the ensuing activity on Mars," he said, like the rock's interactions with the planet's fluids and atmosphere. "What you've got is a little recorder, if you will. That's what us geologists do – we play that back."

Eighty-five scientists have requested a small piece of the rock to use in their own experiments, according to Timothy McCoy, the curator in charge of the national meteorite collection at the Smithsonian.

The scientists will analyze the samples with different goals, such as searching for evidence of life, or learning more about Martian volcanoes. Others might dissolve a piece and measure the different isotope levels inside.

"There are a lot of little signs there that lead us toward a picture of the environment of Mars over the last billion years, and that's pretty cool," Harvey said. "Thirty chunks of rock from 90 billion miles away is really more than we could ask for. It's a dream."

McCoy, who was in charge of classifying the meteorite, said he could tell it was a nakhlite as soon as he looked through a microscope at a one-inch long, hair's width thick piece known as a thin section. Nakhlites are full of minerals that crystallized in the rocks as they hardened. Under the microscope, they look like bits of bright stained glass against a dark background, or like the view through a colorful kaleidoscope.

"The texture of this type of rock is so distinct that you can't possibly mistake it for something else," McCoy said. "They're really pretty."

McCoy said this meteorite has clearly interacted with liquid in its lifetime, but it's not yet clear what kind of liquid. He is one of the people who requested a sample to analyze more fully. McCoy plans to compare the new nakhlite to volcanic rock from a lava flow in Ontario, Canada. That flow is one of the few places on Earth that may be similar to the flow on Mars where the nakhlite originated. McCoy hopes the comparison will help determine at what depth in the flow the meteorite originated.

ANSMET teams have been searching for meteorites in Antarctica since 1976. Meteorites fall evenly all over Earth, but Antarctica is a particularly good place to look for them.

Antarctica's advantage is two-fold, Harvey explained.

"If you want to find things that fall from the sky, lay out a big white sheet," he said. "And Antarctica is a big white sheet 3,000-miles across."

The second reason has to do with the way ice flows across the continent. The meteorites get sprinkled across the ice, and many end up getting



Photo courtesy of Ralph Harvey/ANSMET

A scientist at the Antarctic Meteorite Processing Center handles the Mars rock collected last season in Antarctica.

buried over time. The ice is slowly moving toward the sea, but it gets blocked in places by mountains and forms ice cul-de-sacs. Over millions of years, the ice surface at those bends evaporates, exposing more and more meteorites, Harvey said. ANSMET targets these areas for their hunts.

ANSMET sends out two teams a year, a 4-person reconnaissance team and an 8-person systematic search team. The reconnaissance team usually spends a couple days to a week at each site, checking to see if it's worth returning there. If it's deemed a good spot, a systematic search team will go there another year and spend the whole season collecting meteorites.

This year the reconnaissance team will work at a number of ice fields throughout the mid-range of the Transantarctic Mountains, from the Zanefeldt Glacier in the south to Buckley Island in the north. The systematic search team will work at the LaPaz ice fields, approximately 400 km from the South Pole Station.

Last year's reconnaissance team found the nakhlite on Dec. 15, the third day of its six-week season. The group used snowmobiles to scan the blue ice field in the Miller Range of the Transantarctic Mountains, about 750 km from the South Pole.

"We just knew it was something unusual," said Nancy Chabot, a research scientist at Case Western who was on the reconnaissance team.

The rock was particularly black and quite shiny, Chabot said. The black crust, called a fusion crust, is created because much of the meteorite's exterior gets burned off when the meteorite enters Earth's atmosphere traveling at 10 km to 20 km per second. It also appeared very crystalline, which Chabot said usually indicates that the rock came from a planet.

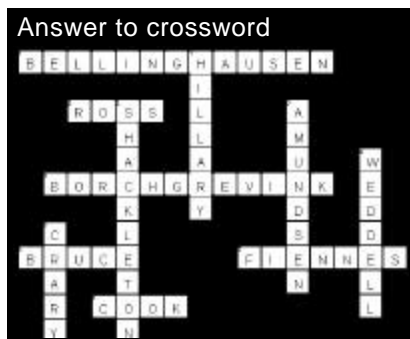
The two ANSMET teams collected a record 1,358 meteorites last season, Harvey said, including not only the nakhlite but a couple new moon rocks and some interesting rocks from asteroids as well.

Chabot said there's little doubt about whether it's worth sending the systematic search team back to the site.

"I can say that definitely with this discovery and the other things we found at the Miller Range, the answer is yes."

Since 1969, more than 16,000 meteorites have been found in Antarctica, more than doubling the number available for study. For those working at or visiting McMurdo Station, there are three types of meteorites on display at the Crary Laboratory.

*NSF-funded research in this story:
Ralph Harvey, Case Western Reserve University, <http://geology.case.edu/~ansmet/>*



Seeing through ozone's disappearing trick



Linnea Avallone is watching the Antarctic sunrise for signs that it is setting off a chain of chemical reactions in the air we breathe.

In the Arctic, the returning sunlight interacts with compounds stored in the snow to trigger the sudden loss of ozone near the ground each March. She arrived at McMurdo Station on Aug. 20 to see if the same is true at the opposite end of the world.

"It's a lot more complex a phenomenon than people originally thought," said Avallone, who also has studied ground-based ozone on the sea ice north of Alaska, at Canadian Forces Station Alert in northern Canada and in Spitsbergen, Norway. Two seasons ago she set up her \$75,000 monitoring instruments at Arrival Heights above McMurdo.

"We had such strange results two years ago we decided to take a step backward and look at some simpler things," she said.

The most surprising data from that year were collected on a windless day in August. The cold, still air held in fumes from vehicles and boilers. Levels of nitric oxide spiked to 300 parts per billion, and the ozone content plummeted to zero. The next day the wind picked up again and the air cleared. The only other time Avallone recorded that much nitric oxide in the air

was rush hour on Route 36 in Boulder, near the University of Colorado, where she is an associate professor of atmospheric chemistry.

Pollutants can react with the ozone and cause it to disappear, as demonstrated at McMurdo that day, but that is only one cause of ozone loss near the ground. She wants to determine the others.

In 1985 researchers discovered that surface ozone would occasionally disappear suddenly in the far Arctic.

"It was happening in such remote places people didn't really care," Avallone said.

Now they do. The low-level ozone loss seems to occur only in springtime, once there is sunlight and open seawater. Avallone thinks snow may also play a role in either absorbing or releasing chemicals that react with ozone. If that's true, understanding the process could help researchers predict how the ozone will react around snowy cities like Denver and Toronto in the winter.

Ozone high in the stratosphere protects the planet from the Sun's radiation, but it is toxic if breathed in high concentrations. The presence of ozone near the ground in concentrations above 50 parts per billion is considered a health hazard and the

Photos and story by Kristan Hutchison
Sun staff

Environmental Protection Agency puts out air quality warnings.

Another reason to study ozone is that its movement through the atmosphere is similar to mercury. Mercury becomes a health concern when it works its way into the food chain, building up to dangerous levels in fish in some areas. In the atmosphere, mercury is too diffuse to track, but tracking ozone, which is 1,000 times more common, could give scientists an idea of how the mercury moves from the air into the water.

This year Avallone moved her project to a hut on the ice 19 km from McMurdo, where the air remains pure. An unmuffled Honda engine rumbles inside the hut, keeping the computers and air analysis working. It's exhaust is vented away from the plastic tubes that run through the roof, sucking in samples of air to monitor the ozone, nitrogen oxide and carbon dioxide. Avallone snowmobiles out almost daily to crouch on the floor in front of a laptop, checking that the instruments are working correctly. Usually graduate students Sean Davis and Lars Kalnajs go with her.

"All you can see is what nature brings you," Avallone said.

NSF-funded research featured in this story:

*Linnea Avallone, University of Colorado,
<http://lasp.colorado.edu/~avallone/winfly04.html>*



Atmospheric chemist Linnea Avallone checks ozone monitoring equipment while graduate student Sean Davis watches. Above, they return to the hut after collecting snow samples.

Ozone's two sides: high and low

Generally ozone near the ground, where Linnea Avallone studies it, doesn't receive as much attention as the protective layer of ozone 24 km above the Earth. At that elevation, the ozone layer acts as a sunblock for the world. The seasonal thinning of ozone above the Antarctic, first reported in 1985, is like a gap in the sunscreen, leaving the continent exposed to the full force of the Sun's ultraviolet radiation for several months.

Science technicians at the South Pole send up balloons regularly to measure the ozone hole caused by ozone-destroying chlorofluorocarbons. This year the hole was about 20 percent smaller in area than last year. It currently covers about half the continent, exposing Antarctic workers to higher levels of ultraviolet radiation, according to the most recent World Meteorological Organization Antarctic Ozone Bulletin.

Near the ground the same ozone plays a different, more destructive role. The US Environmental Protection Agency regulates ground-based ozone as one of five major air pollutants. Usually ozone makes up 25 to 30 parts per billion of the air we breathe, but the concentrations have been increasing worldwide in pace with the burning of fossil fuels. Eventually this could hurt plants and animals, including humans. A high concentration of ozone can cause shortness of breath, chest pains, wheezing, coughing and inflammation of the lung lining. It also can inhibit the growth of plants.

All-Sky Imager, SPIFI report back from winter night

By Brien Barnett
Sun staff

Two projects were particularly successful this past austral winter at South Pole.

This winter the All-Sky Imager gathered images of proton auroras, according to Yusuke Ebihara of Japan's National Institute of Polar Research.

The institute cooperates with the U.S. National Science Foundation to operate the imager in Antarctica.

The images of the auroras were captured with highly sensitive optics and a camera. They revealed that in addition to electrons, energetic protons were precipitating over Pole.

"We believe that the origin of the protons is in most cases the vicinity of the outer edge of Earth's magnetosphere," Ebihara wrote *The Antarctic Sun*.

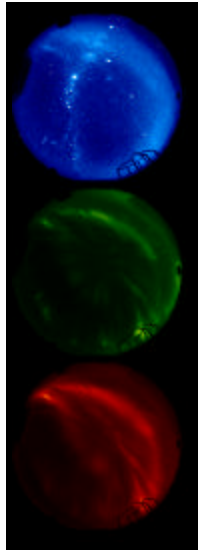
The magnetosphere is a cavity in which the Earth's magnetic field is constrained by the solar wind and the interplanetary magnetic field.

"South Pole is the ideal site for capturing such proton images because of less contamination from the sunlight during the austral winter season."

In another project, an instrument to study the birthplace and nursery of stars in the Milky Way and other galaxies returned to service and made its debut on the Antarctic Submillimeter Telescope and Remote Observatory, AST/RO, at the South Pole.

The South Pole Imaging Fabry-Perot Interferometer, SPIFI, met the goal of proving it could operate at the station, reported Thomas Nikola of Cornell University.

The spectrometer detects light in the submillimeter wavelength region of the spectrum. It examines radiation emitted by ionized nitro-



Courtesy of Yusuke Ebihara/Japan's National Institute of Polar Research

From top to bottom, three aurora snapshots from June, 14, show proton (blue), electron green (green) and electron red (red) precipitation over the South Pole.

gen, neutral carbon and carbon monoxide in and around the clouds where stars are born in galaxies.

"We try to find out how molecular gas is fed into the center of our galaxy and towards the central black hole," Nikola said.

Despite some challenges, including poor weather and limited helium supply, the wintering scientists were able to put SPIFI into operation.

Another obstacle the scientists overcame was working outside in the winter cold to operate a special refrigerator that cooled SPIFI to an operating temperature of 0.06 degree above absolute zero.

Once operational, SPIFI showed it could record information about ionized nitrogen in the Milky Way and other galaxies. This wavelength is not accessible at the instrument's alternate home atop Mauna Kea in Hawaii.

"SPIFI is currently the only instrument that has the large bandwidth and sensitivity to carry out those observations in external galaxies," Nikola said.

This summer, Nikola and others will add some equipment so operators can switch easily between submillimeter windows. That will allow data to be recorded even on poor weather days. SPIFI will return to service in the next austral winter.

Also this year, SPIFI team members submitted a paper to the *Astrophysical Journal* based on earlier research. It is being reviewed before publishing.

NSF-funded research in this story: Masaki Ejiri, National Institute of Polar Research (Japan), <http://polaris.isc.nipr.ac.jp/~asi-dp/>; Gordon Stacey, Cornell University, <http://astro.cornell.edu/~spifiweb/spifi>

Holding on to Helium

Many winter astrophysics projects depend on liquid helium to keep the instruments cool enough to gather data, but liquid helium is notoriously difficult to store. It boils at -269C and can escape through hairline cracks. This year the supply of helium lasted until around Aug. 8, said Nicholas Tothill, the wintering station science leader at South Pole.

"That was pretty unexpected," said Jesse Alcorta, cryogenic technician for Raytheon Polar Services. "We would have hoped for at least another month out of that."

Since then, the astrophysical equipment has been waiting for a resupply of helium, due at the Pole Nov. 8.

Alcorta expects the difficulties with storing helium may be solved by the construction of a new cryogenic facility at the South Pole, which should be completed by January. The building will keep the helium storage containers protected from the Pole's extreme weather and allow technicians to transfer helium inside.

"It'll probably be a big step forward," Alcorta said.

For a fuller explanation of helium at the South Pole, see the June 21, 2004 Antarctic Sun.

Continental Drift What are you most excited to see or do in Antarctica?



Cara Ferrier
Sr. Asst. Supv. Lab Operations, Denver, Colo., first season.

"To see the plants that grow near Palmer Station. I had no idea that plants grew in Antarctica."



Delma Irvin
chef, County Offaly, Ireland, third season

"Making our supplies last and still being able to deliver tasty product to our cold, hungry, overworked, underpaid staff."



Kelly Kozdras
Chicago, Ill., South Pole electrical engineer, first season

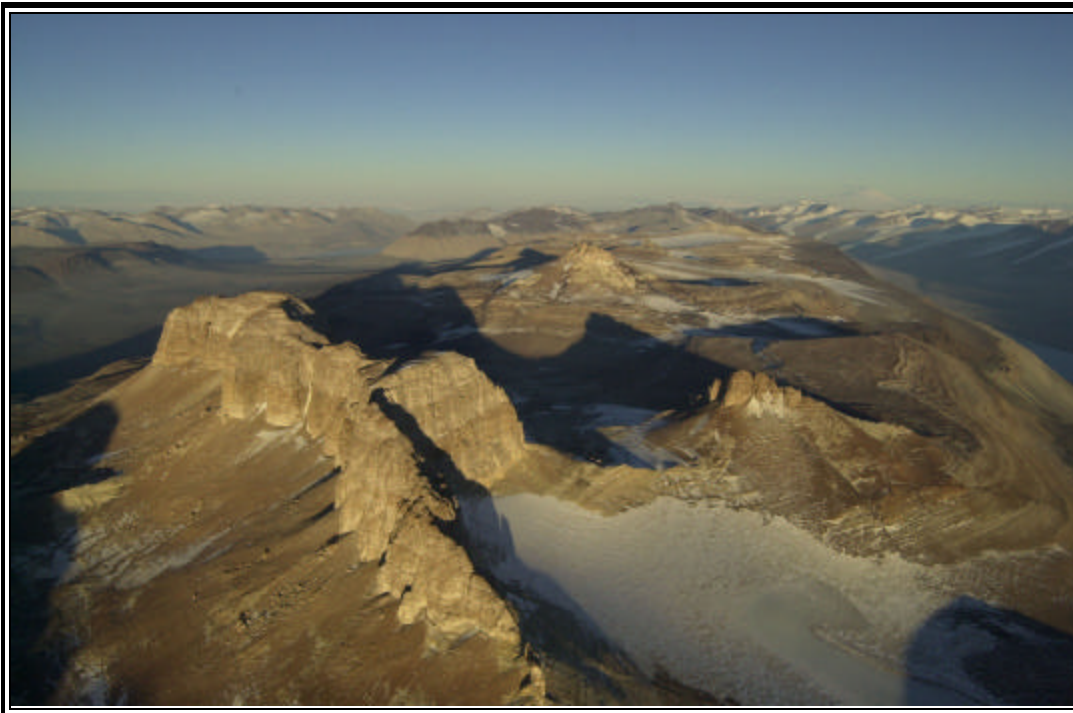
"Penguins... when I'm back in McMurdo."

Flying through golden evening light over the Dry Valleys, Yann Arthus-Bertrand, arguably one of the world's most famous photographers, set down his own camera and turned to the journalist beside him.

"Here, let me take one for you," he said, reaching for *The Antarctic Sun* camera. "The light is better on my side."
These are those photos...



Photo by Kristan Hutchison/*The Antarctic Sun*
Yann Arthus-Bertrand shoots out a window installed for him in one of the Petroleum Helicopter Inc. A-Stars.



A ridge in the Asgard Range.

Antarctica from Above

Photos by Yann
Arthus-Bertrand

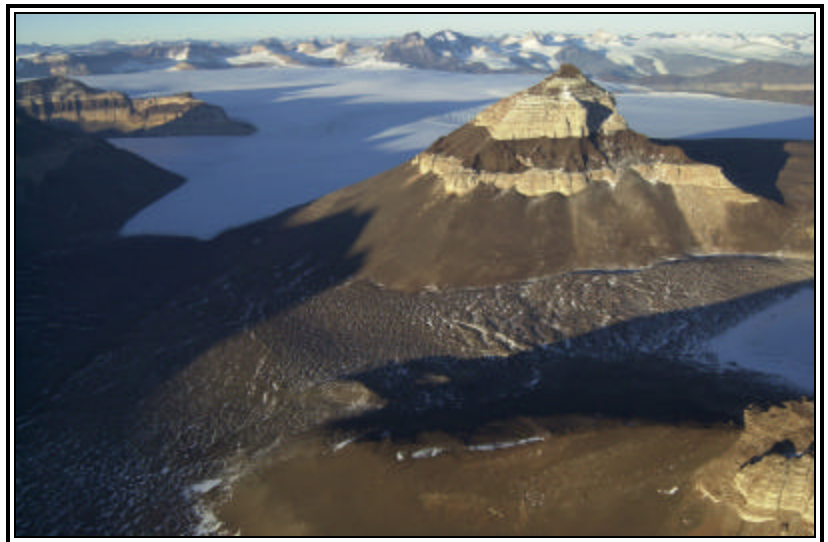
Light is so important in my work, to show me the shadow, the color, the movement," Arthus-Bertrand said.

From above, he seeks out patterns on the ground. He uses the helicopter like a flying tripod, instructing the pilot to nudge it down or over until he finds the right angle.

"The pilot is very important for me," he said. "They are really between me and the photograph."

The black and white shapes created by freezing and thawing in the dirt behind Black Island remind him of elephant skin and he begins snapping. The Erebus Glacier Tongue is like a fish bone laid on a white dinner plate.

"To see something beautiful like that without a camera — I become mad," he said.



West Beacon peak.



It was 10:30 p.m. and the light was fading when the helicopter stopped to refuel at Marble Point for the trip back to McMurdo across the sea ice. Even though she'd been roused from bed to pump gas, fuelie Wendy Mahovic greeted Arthus-Bertrand with a smile. He insists on taking her photo too.

Though people rarely appear larger than ants in his most famous photo book, *Earth from Above*, Arthus-Bertrand has a keen interest in the people he flies over.

"You must love people. If you don't love the people, you need a different job, so when I'm flying like this I think I need to speak with the people," he said.

Profile **Sharing a higher perspective**

By Kristan Hutchison
Sun staff

Four thousand feet above an Antarctic glacier last week, French photographer Yann Arthus-Bertrand slid open the helicopter window and leaned forward into the blast of freezing air. After a few measured clicks of the camera, he tucked it between his knees and selected another from the collection laid out on the back seat, the largest with a lens a half-meter long and as big around as a salad plate.

In two weeks at McMurdo Station, Arthus-Bertrand spent 30 hours in the air and used up 250 rolls of film. The best photos will become part of a scientific databank of the Earth seen from above, which he started in 1995 under the patronage of the Ecological Science department of the United Nations Educational Scientific and Cultural Organization.

"When I began the project, I was thinking to do it in five years and now I know that I am never going to be finished," he said. "It is a life job."

His first application to the National Science Foundation was turned down. The US program usually only gives grants to Americans. Arthus-Bertrand went instead to the French base at Terra Adelie in 1999 and published photos from there in *Earth From Above*. The book of aerial photos from 150 countries became highly successful, selling close to 2 million copies. More than 30 million people have seen the free photo exhibit.

"Mr. Bertrand has an enormous following; *Earth from Above* is everywhere, and one indeed wonders why others' aerial photographs don't do for the viewer what Bertrand's do. But that is the art and the artist at work," wrote Guy Guthridge, who oversees the Antarctic Artists and Writers grants for the NSF. He invited Arthus-Bertrand to reapply. "I see the potential for delivering new and memorable antarctic images from one of the most viewed parts of Antarctica—the McMurdo Sound region."

At first, Arthus-Bertrand hesitated to return to the Antarctic, assuming the area around McMurdo would be just more snow and ice.

"It's so far to go to work for 10 days," he said. Others on his staff convinced him it was too good an opportunity to turn down. Last week he e-mailed them to admit they were right.

"Really, I think it's one of the 10 best trips I've taken," he said.

Antarctica's beauty comes with chal-

lenges. He lost about 20 rolls of film because the cold made them so brittle they broke. Shooting out the open window of a helicopter, his fingertips froze through the thin fleece gloves he wore, but anything thicker would have made the camera hard to handle. He didn't notice the cold anyway until he set down the camera.

Taking off around 7 p.m. most nights to catch the best light, Arthus-Bertrand traveled to Mount Erebus, through the Dry Valleys and Transantarctic Mountains and south over Minna Bluff.

As the helicopter hovered over a semi-circle of black moraine on a white glacial field near Garwood Valley, he happily sang a few bars in French as the shutter clicked, then whispered "merci."

"It's like a gift you receive, the picture," he said as the helicopter moved on. "It's exactly the thing I want to do with aerial photography, you know, to show the thing you cannot see from the ground."

In many of his well-known aerial pho-

**"When you fly, there's no border.
Everybody's the same from the top."**

— Yann Arthus-Bertrand

tos, the ground becomes a tapestry, a rich weaving of color and texture that only at a closer look becomes a place. He hopes viewers will see in it not just the beauty of the Earth, but a deeper message.

"All my photography is done to think. It's not to say, oh, the world is beautiful," he said. "We are trying to explain everybody is responsible for this planet."

Arthus-Bertrand already had a love for nature when he discovered both photography and flight. He began using a camera to document a pride of lions on the Masai Mara reserve in Kenya from 1976 to 1979.

"In this time, I became a photographer, because it was quite evident to me that sometimes what you can explain in photography, you cannot explain in writing," he said.

At the same time he was taking tourists up in a hot air balloon to support his family, and discovered another perspective from the air.

"When you fly, there's no border," Arthus-Bertrand said. "Everybody's the same from the top. There's no religion, no race."

A decade later he was back in Africa and had another experience that led to his newest video project, *Six Billion Others*. His helicopter landed in a small village of



Photo by Kristan Hutchison/The Antarctic Sun

French photographer Yann Arthus-Bertrand directs the helicopter pilot as they fly over the Dry Valleys near McMurdo Station, searching for the perfect shot.

three homes and he visited all day with the family living there. He took them in the helicopter. They killed a goat for him. By the end of the day he and the patriarch of the family were speaking like brothers.

"Speaking with him very deeply, he told me his only ambition was to feed his children," Arthus-Bertrand said. "My ambition and his ambition was very far away."

This awareness of the people he flies over and photographs stuck with Arthus-Bertrand, who decided two years ago to begin interviewing them. He and his staff are asking the same questions of 20,000 people around the world, from Indian farmers to UN chief Kofi Anan. In McMurdo last week he videotaped more than 20 people answering questions such as: What makes you angry? What is your favorite song? Why is there war? And what do you think happens after you die?

So far, the answers from more than 700 people representing more than 16 countries show how much everybody is the same, and at the same time different depending on their culture, economy and experiences.

"It's interesting when you're challenged with some of these questions," said Alan Shaw, a worker in fleet operations whom Arthus-Bertrand interviewed. "They're the sort of questions you don't ponder unless you're put on the spot."

As a continent shared by all, Antarctica already is an example of what the world could become, Arthus-Bertrand said.

"It is a country of everybody, everybody is your family," Arthus-Bertrand said. "We have to live together. When you think about ecology, everybody thinks about sustainable development now, but first live in peace. Nothing's going to happen if we don't live in peace."