



December 21, 2003

Balloons up and away

TRACER takes flight

By Brien Barnett
Sun staff

Inside TRACER mission control, Patrick "JoJo" Boyle sits in the six-foot square office listening to music and watching computer monitors for incoming data and messages.

Every now and then Boyle points to the monitor where a string of bright red pixels suddenly appear, indicating a recent high-energy cosmic ray event. The tone of his voice shows excitement.

"Oooh, that's a big event... That's an iron event for sure ... There's another one."

Behind him, in the office at McMurdo Station's Crary Laboratory is a map of Antarctica with a semicircle of sticky notes stuck to it. The stickies indicate the flight path and altitude of the balloon at regular intervals. In five days, the balloon carrying the \$10 million instrument called the Transition Radiation Array for Cosmic Energetic Radiation has passed an old point on the map. Written in pencil with a circle and the word

See Tracer on page 10



Photo by Melanie Conner / Special to The Antarctic Sun

The scene at Williams Field last week looked like a high school pep rally as spectators turned out to cheer on the crews preparing a long duration balloon for liftoff. The payload that day included the TIGER instrument. The crowd sported posters of a tiger, chanted T-I-G-E-R and included a woman dressed in a tiger outfit.

Home away from Dome

By Kris Kuenning
Sun staff

As steel and plywood panels continue to go up at the new Amundsen-Scott South Pole Station building, this season's residents are living out the transition from old Dome to new station.

With the summer crew settling into the first two occupied sections of the new station, there is some nostalgia for Dome life, but the large new dining facility, with windows overlooking the ceremonial South Pole, has won a lot of hearts over already.

"I don't miss the old galley one bit," said cargo technician Scot Jackson, "and I really thought I would."

Head chef "Cookie" Jon Emanuel is enjoying the new facilities, too, but is feeling the pangs of the transition when it comes to getting supplies up to the second floor kitchen. Despite the limiting size and aging facilities of the old kitchen, the food stores were always in easy reach under the Dome. Without the new warehouse constructed or the cargo elevator running, kitchen supplies are now brought to the second floor landing by forklift and then passed hand by hand down the hall.

"Lots of departments are dealing with these types of juggling acts in terms of space, equipment and logistics, and will be until the station is complete."

See Dome on page 11

INSIDE

Baby berg
born to the B15A
Page 3

A Massif man
Page 12







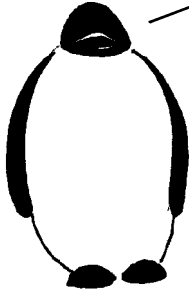
Quote of the Week

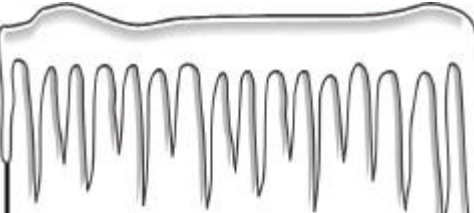
"Teamwork is everybody doing what I tell them to."

- Manager at an Antarctic field camp

Ross Island Chronicles

By Chico

 <p>Hey! Look over there. It looks like there's someone coming.</p> 	<p>Can you please help us. We were flying on our way to the South Pole when we encountered a monster blizzard out of nowhere.</p> 
<p>It was horrible. We crash landed and got split up. We found one of the reindeers frozen nearby so we've been able to make some jerky for food.</p> 	<p>Pssst. ... I think this guy has already hit the point of no return. Look at his eyes. He looks like a serial killer.</p> 
<p>What do you suppose we do with them?</p> 	<p>WHAT!!! Where's your compassion. It's Christmas. Let's invite him for dinner, then we'll lock him up.</p> 



Cold, hard facts

How far ...

Newsmaker Saddam's so-called "spider hole" to ...

McMurdo: 12,639 km
South Pole: 12,064 km
Palmer: 12,420 km

McMurdo residents recently had **crab legs** for dinner. We assumed they were caught in Dutch Harbor, Alaska: **12,733 km away**

Palmer Station to McMurdo is 3,294 km away as the skua flies, but it takes a person **21,346 km** to travel from the Peninsula to Ross Island.

Santa must travel **14,965 km** to deliver presents to the good kids at **South Pole**.

E-mail travels at least 70,000 km on its journey from the continent to the satellites to the ground and then to friends and family at home.


Happy holidays!
Primary source: McMurdo GIS

The Antarctic Sun is funded by the National Science Foundation as part of the United States Antarctic Program (OPP-000373). Its primary audience is U.S. Antarctic Program participants, their families, and their friends. NSF reviews and approves material before publication, but opinions and conclusions expressed in the *Sun* are not necessarily those of the Foundation.

Use: Reproduction and distribution are encouraged with acknowledgment of source and author.

Senior Editor: Kristan Hutchison
Editors: Brien Barnett
 Kris Kuening
Copy Editors: Geoff Jolley, JD Menezes
 Wendy Kober,
 Melanie Conner
Publisher: Valerie Carroll,
 Communications manager, RPSC
Contributions are welcome. Contact the *Sun* at AntSun@usap.gov. In McMurdo, visit our office in Building 155 or dial 2407.
Web address: www.polar.org/antsun

Matt Davidson



Good skua, dude!!

The crack that created the new iceberg was visible in the center of this photo taken during an October flight to B15A.

Photo by Brien Barnett / The Antarctic Sun



B15A continues to break up

Expert first spotted crack that led to new iceberg during mission in October

By Brien Barnett
Sun staff

Smack. Whack. Just like that, iceberg B15A has lost another chunk, now tentatively named B15K.

The new iceberg came from the west side of B15A after days of storms and repeated ramming against nearby iceberg C16. B15K is estimated to be about 10 km wide by 40 km long.

The icebergs, including the previously spalled berg B15J, lie just north of Ross Island. Ocean currents, islands and seafloor ridges have pinned the icebergs into a corner where they are beginning to break up after more than two years of almost no activity.

Iceberg researcher Doug MacAyeal of the University of Chicago said the recent storm that brought 50-plus knot winds and nearly a foot of snow to McMurdo, likely played a role in roughing up the bergs.

In October, MacAyeal spied the crack that would become the new iceberg. He spotted the clean break in satellite photos after the clouds cleared. Specialists at the University of Wisconsin-Madison's Antarctic Meteorological Research Service confirmed it.

The beating C16 is taking has MacAyeal wanting to get a team back out to that iceberg to retrieve \$400,000 worth of seismic gear he fears may be lost into the sea.

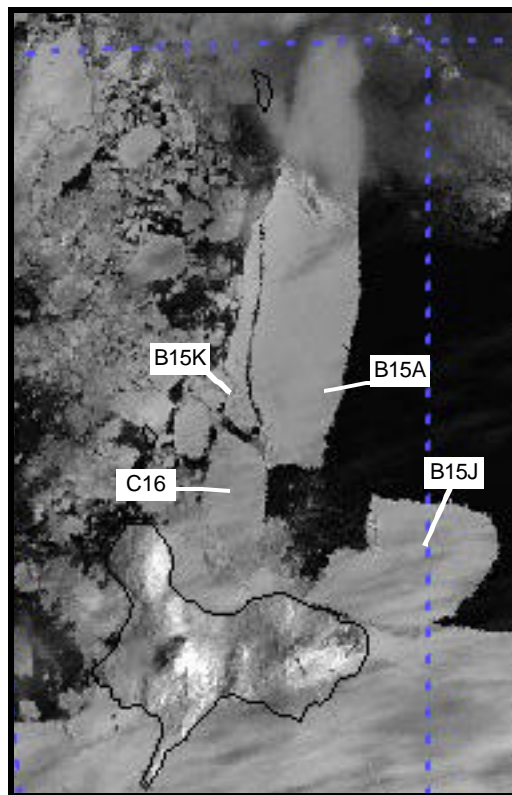
His group placed the instruments on the iceberg in October and he had planned to leave them there through the winter. The recovery attempt may come in January. But while he's concerned for the instruments, MacAyeal said the breakup continues to be good news.

"We're delighted because the more action the better," MacAyeal said. "We wanted to see what the life cycle was and by golly we're getting what we were wanting."

MacAyeal offered his "best guess" scenario for the short-term future of the bergs.

The new iceberg sliver may be low enough to pass over the seafloor ridges or break up into smaller pieces and enter McMurdo Sound. That could create some headaches for the icebreakers and re-supply vessels now headed this way. Over the fall and early winter, MacAyeal said the bergs might begin to head north if conditions are right.

National Science Foundation funded research in the story: Doug MacAyeal, University of Chicago, <http://amrc.ssec.wisc.edu/amrc/iceberg.html>

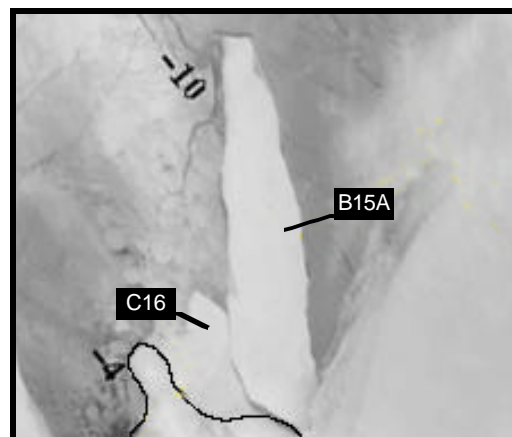


December 2003

The new iceberg, B15K, is clearly visible to the west of its parent, the giant B15A.

Smashed bits of ice are visible north of Ross island, providing evidence of the destruction caused by the icebergs colliding repeatedly over the last month or so.

East of iceberg C16, B15J has rotated so the jagged point where it broke with B15A is now facing west.



October 2003

B15A is intact with C16A just to the southwest of it.

Satellite photos courtesy of Antarctic Meteorological Research Center at the University of Wisconsin, Madison



Perspectives Perspectives

Curious Christmas. Thoughts of home.

How do you pack a holiday into 75 lbs of luggage? A string of lights, some tinsel, a cardboard tree... We've all walked into stores draped with the stuff and realized the decorations don't make the season.

So what does? There aren't any children in Antarctica, eyes wide with wonder, for us to live through vicariously. Most of the traditions of home, the family, the baking, the fresh scent of pine, have been left behind.

Winter holidays hit Antarctica midsummer, when the sun is high and scientists are busy. For some researchers in the field, Christmas will be just another day, living in a tent, melting water over a camp stove, collecting data on penguins or glaciers, or cracking open rocks to see what present is hidden inside.

Many workers will clock in Christmas morning too, manning the radios, keeping the generators running, making meals and cleaning dishes.

Even those with the day off struggle to find a meaningful way to spend it when their families are several plane rides away, living an entirely different day. The early explorers faced the same dilemma, but no matter their circumstances they found a way.

On board the *Terra Nova* in 1910, Robert Falcon Scott and his crew enjoyed a festive Christmas.

"I don't think many at home had a more pleasant Christmas Day than we," wrote Apsley Cherry-Garrard. "It was beautifully calm with the pack all round. At 10 we had church with lots of Christmas hymns, and then decorated the ward-room with all our sledging flags... The men forrard had their Christmas dinner of fresh mutton at midday; there was plenty of penguin for them, but curiously enough they did not think it good enough for a Christmas dinner.

The ward-room ate penguin in the evening, and after the toast of 'absent friends' we began to sing, and twice round the table everybody had to contribute a song. Ponting's banjo songs were a great success, also Oates' 'The Vly on the turmets.' Mears sang 'a little song about our Expedition, and many of the members that

Southward would go' of his own composition."

Penguin won't be served at McMurdo this year, but a small chorus has been practicing carols at Chapel of the Snows. On Christmas Day the stations and field camps will radio each other, exchanging greetings and taking turns caroling the others.

Shackleton's crew aboard the *Endurance* also ate well on Christmas 1914, still hopeful they'd succeed in crossing the continent. The *Endurance* was pushing through pack ice in the Weddell Sea, moving less than 30 miles a day. The crew had expected to be ashore by the end of December. Instead, they were not even across the Antarctic Circle.

"We will have fine dinners ... and never again will I eat dog."

- early explorer Xavier Mertz

In spite of the disappointing progress, they celebrated Christmas festively. The wardroom was decorated with bunting and they had an excellent dinner of soup, herring, jugged hare, plum pudding, and sweets, washed down with stout and rum. Afterward there was a hearty songfest, with Hussey playing a one-stringed violin he had made himself. That night before he turned in, Greenstreet recorded the day's events in his diary, concluding the entry with these words:

"Here endeth another Christmas Day. I wonder how and under what circumstances our next one will be spent. Temperature 30 degrees."

A year later their ship had sunk. The crew ate cold seal steak and tea after five hours pulling life boats across the ice flows. All Shackleton wrote was "Curious Christmas. Thoughts of home."

He roused the men again at midnight and resumed the march.

Douglas Mawson was also in the middle of a brutal march on Christmas 1911,

with just one companion and one dog left. The sled with most of their supplies had been lost into a crevasse and they were resorting to eating the dogs. On Christmas Eve they staved their hunger with a piece of cold, scorched dog liver and a reboiled tea bag. His only feasts were in his dreams. He dreamt of a bakery filled with cakes several feet in diameter on a street with windows decorated with candle-lit trees and bunting. But he woke before he could taste the cake.

Instead of cake, he found half a biscuit he'd been hoarding and gave half to Xavier Mertz with some dog stew.

"A relic of better days, Xavier," he said.

For seven hours they walked through the snow showers, then camped again. To celebrate Christmas they added a knob of butter to their ration of dog stew.

"Let us thank God, Xavier, that we are still alive. Let's promise to remember each other on this day for the rest of our lives – and to celebrate this day together when we are in better circumstances."

Mertz brightened: "Yes, yes. When we get to the hut I will make your Whisky Omelette Mawson! We will have fine dinners ... and never again will I eat dog."

This week at the Antarctic research stations we are at least assured a feast on Christmas Eve, no dogs allowed. South Pole's dinner will be candle-lit, served on white tablecloths. At Palmer Station people have spent hours making gifts to exchange. Here in McMurdo, the dining attendants hung stockings, and some green dishwashers gloves, below the wide screen TV in the dining hall. The branches of the plastic tree have been dusted off and hung with ornaments. Garlands festoon the hallway outside the recreation office.

Like the men with Scott, Shackleton and Mawson, we will toast absent friends, think of family and then celebrate a sunlit holiday with what we have.

Compiled by Kristan Hutchison. Quotations taken from: The Worst Journey in the World by Apsley Cherry-Garrard, Endurance: Shackleton's Incredible Voyage by Alfred Lansing and Mawson's Will by Lennard Bickell.

around the continent

PALMER

Plant life at Palmer

By Kerry Kells

Palmer correspondent

As our local islands started to sprout with bits of green plant life, a new research group arrived at Palmer Station. Biologists Tad Day (principal researcher), Christopher (Wally) Ruhland (co-principal), Sarah Strauss and Ji Hyung Park will study the plants and soil of the Peninsula. This group will examine the alterations and responses of landbased ecosystems to short and long term climate changes. The ecosystem they study includes nutrient pools, plants, litter and soils in communities dominated by vascular plants – higher order plants with a system for transporting water. The goal is to predict how long-term climate change will impact ecosystem productivity.

Behind Palmer Station, the researchers have set up an area for the soil and plant experiments. They will collect 4-inch to 5-inch thick, round sections of tundra, called cores, with plant and soil intact. The two plants they are studying are a short native grass commonly called Antarctic hair grass and a moss-like plant with white flowers called Antarctic pearlwort. About 240 cores containing both species will be collected from different local islands. The cores will be brought back to grow in plastic pipes under a manipulated climate. These samples will reveal the ecosystem's response to climate changes.

Day's group has expanded and refined its methods from earlier research during the 1995 to 1999 summer seasons. At that time they brought the controlled climate to the plant. Small cages, like miniature greenhouses, enclosed a plot of land for passive warming experiments emulating global warming. They also used the greenhouses to filter out various amounts of ultraviolet-B radiation.

This time Day's group will use three experiments over three research seasons to track the impacts of temperatures (global warming), exposure to ultraviolet-B radiation (ozone depletion) and increased precipitation (possibly caused by global warming). Infrared heaters placed over one set of

cores will raise the plant and soil temperatures to varying degrees. As an improvement from earlier seasons, the heaters can warm the plants day and night. Ultraviolet-B absorbing filters placed over another set of core samples will emulate different levels of ozone. Another group of cores will receive extra water to mimic greater precipitation.

The research also will measure and sample natural communities on a few local islands. One such study may compare the ecosystems of a north-facing slope and an adjacent south-facing slope to the experimental cores at the station. The team will compare the gradients of temperature, snowpack and moisture on these slopes, as well as levels of carbon and nitrogen in the plants and the composition of the soil. The arrival of the researchers in mid-December allows them to study the late spring snowpack patterns of these areas. For example, these Antarctic plants need to store enough carbon in their roots to sustain them through the winter. Greater precipitation during the winter along the Peninsula may lead to more snow accumulation and later snow melt dates. A late snow melt can exhaust the plants, causing them to perish. Subsequent seasons at Palmer will allow manipulation of snowmelt times in plots on these islands.

For this and the next two summers, Day and his researchers will heat, water and expose their sample plants to create environments reflective of global warming and ozone depletion. Their experiments could give a picture of a vastly different Antarctic Peninsula many years in the future.

SOUTH POLE

'Tis the season of building

By Tracy Sheeley

South Pole Correspondent

The South Pole season keeps flying along, and most Polies find themselves wondering how the Christmas holiday can be less than a week away!

We have reached our maximum population, and while people will come and go, we expect to maintain high numbers until the end of the summer season – construction, science, and support staff – all have a full

plate.

The construction of the elevated station is moving along quickly. Panels are going up on the B-3 pod, which marks the farthest pod toward the skiway. The steel crew continues to erect the frame of the remaining pods, which extend off the main length of the station. Each passing day brings a new view on the future. Interior crews are working on the new medical facility, station store and computer lab, which we hope will come online late in the summer. The information technology department is working on the transition as well – relocating satellite dishes and equipment to the radio building, which will be the communications base of the new station. From the 24-hour-shift work to the kitchen staff cooking up a storm and the janitors preparing rooms in the 20 minutes between when a room is vacated and when it is re-occupied – all of this is part of the 2003-04 jigsaw puzzle at the Pole.

Science, of course, is alive and well at South Pole. We've had a flurry of activity at the Atmospheric Research Observatory as several science groups share space and resources in their atmospheric studies. The annual snow stake runs, which measure the accumulation of drifted snow on the polar plateau, wrapped up last week. We've also played host to science in transit, greeting both the meteorite hunters and an Automatic Geophysical Observatory group.

SHIPS

Laurence M. Gould

Calm conditions helped the *Laurence M. Gould* collect five hours of underwater and bird feeding video. Along with plankton collecting, this completed the work for the Veit seabird research group. Snow and wind was still hampering groups at Seymour and Vega Islands. On Wednesday, the Seymour group reported a work day after two days of being tent bound. The *Gould* was scheduled to pick up the Seymour camp on Saturday and Vega group on Sunday.

Nathaniel B Palmer

The *Nathaniel B Palmer* left Lyttelton, headed for Antarctica, on Dec. 18.

the week in weather

McMurdo Station

High: 37 F / 3 C
Low: 16 F / -9 C
Wind: 23 mph / 37 kph
Windchill: -17 F / -27 C

Palmer Station

High: 40.8 F / 4.9 C
Low: 28.04 F / -2.2 C
Wind: 40.5 mph / 65 kph
Windchill: 18.3 F / -7.6 C

South Pole Station

High: -4.2 F / -20.1 C
Low: -17.9 F / -27.7 C
Wind: 24 mph / 38.6 kph
Physio-altitude: 9,835ft / 2,998 m

Test flight preps way for hunt for 'killer' particles

By Brien Barnett
Sun staff

A test to check instruments that will be used to detect strange phenomena in the magnetosphere was launched via balloon last week.

The balloon climbed to 15,200 meter and the 31 kg MINIS payload collected and transmitted data back to a lab in Berkeley, Calif., in the first few hours after launch. However, the balloon descended rapidly and unexpectedly landed on Mount Discovery, where it lost some gear. The balloon eventually dragged its way to the top of the mountain and traveled to about 900 km west of McMurdo where it finally landed.

MINIS, an empty acronym pun based on a previous project called MAXIS, had enough battery life to last eight days, but project team member Edgar Bering III said the instrument was damaged as it was pulled up and off the mountain by the balloon.

Bering suspects the post-launch setbacks were caused by a leak in the small long duration balloon and not the scientific gear it was carrying. Bering said he thinks the instruments proved they worked, though the data will have to be analyzed.

The lessons gleaned from the flight will be incorporated in a series of planned flights in the next year or so that will hunt for high energy "killer" particles cycled by the earth's magnetosphere, the feature in outer space created by the earth's magnetic qualities.

Bering said the particles are interesting because they have been detected by scientific missions only a few times, but indicate a major disturbance in the magnetos-



Photo by Brien Barnett/The Antarctic Sun

Brandon Reddell smiles as Michael Kokoranaski pumps his fist in celebration after hearing a report from John Sample on the satellite phone that the MINIS team back at UC Berkeley was receiving good data from the instruments they had just launched from the long duration balloon facility at Williams Field.

phere capable of killing satellites and creating disruptions to electrical systems on the surface.

"We needed to fly a detector that had a high enough energy range," said John Sample, a doctoral candidate who is working on the project.

The primary goal of the \$350,000 project is to launch a series of four balloons in a row from the South African Antarctic base, SANAE, to attempt to detect the high-energy particle shower.

The researchers want to determine whether it is a one-time occurrence, like someone turning a faucet on and off, or if

there is a constant stream of particles in a very narrow area.

Also, they would like to learn more about the properties of the particles. The information they obtain could help power companies guard their extensive grids and space agencies protect satellites and astronauts.

National Science Foundation funded research in this story: David Smith, University of California Berkeley, <http://www.geophys.washington.edu/Space/SpaceExp/Balloon/Antarctica99/>



What holiday gift would you like?



"Socks and underwear. That's what my mother always sends me."

Mike Polito
Copa field camp
seabird biologist from
Cleveland, Ohio,
third season



"Shower shoes. 88 cent flip flops."

Sean Hufstetler
South Pole comms technician
from Wasilla, Alaska
first season



"Most of what I want I can't have."

Greg Gonzales
McMurdo FEMC coordinator
from Broomfield, Colo.
first season



Justin Sikora, an eighth-grade student from Ogdensburg Public School holds up a vial packed with mineral samples that will fly on the Aria - 9.

Kids play at balloon science

By Kris Kuenning
Sun staff

Photos courtesy Claude Larson / Ogdensburg Public School

A high-altitude balloon carrying two high-tech astrophysics projects is circling Antarctica in the company of nail polish, chewing gum and a collection of New Jersey rocks next month.

Why? So that almost a thousand school children can study the effects of ultraviolet light and cold weather on a range of materials.

Project Aria is a Washington University School of Engineering outreach, research and education program started by former space program manager Keith Bennett in 1998. So far, the project has involved about 3,000 K-12 students from around the U.S. and Australia in aerospace projects.

For Aria's first Antarctic project, Aria-9, a package of student experiments has been attached to a high-altitude balloon that researchers hope will circle the Antarctic continent at 125,000 feet for more than 30 days. The balloon, launched last week from McMurdo Station, also carries devices to measure galactic cosmic rays and very high frequency and ultra high frequency (VHF/UHF) noise levels.

Aria-9 involves about 950 students from 26 schools. They will compare the samples recovered from the balloon flight with identical samples left on the ground at McMurdo and another control sample, left at home.

Science teacher Claude Larson is coordinating the experiment for Ogdensburg Public School in New Jersey. The Ogdensburg project is replacing one that was lost in the ill-fated Columbia 107 space shuttle. The students, who are eighth graders, are using this experiment to see if the effects of increased ultraviolet radiation will affect the fluorescence of the minerals they have collected.

Ogdensburg has picked up the spirit of

the space program by assigning its project an interesting acronym. "OGRE stands for Ogdensburg Glowing Rocks Experiment," Larson said. "Ogdensburg is world famous for its diversity of minerals, 340 in all, and high concentration of fluorescent minerals. Most areas of the world have about 30-40 types of minerals in one locale."



Photos courtesy Claude Larson / Ogdensburg Public School

In the foreground, Ogdensburg Public School students Amanda Rillo and Nicole Olinger work with Maureen Verbeek to chisel some minerals to send into the Antarctic atmosphere.

Larson said the students have learned to operate a spectrofluorometer to measure light emissions of the minerals and have been studying the electromagnetic spectrum as part of their earth science class.

"This experiment was carried out at the local mine where the students selected minerals, sawed them to size, tested their fluorescence, photographed them under UV light and tagged them," Larson said.

"Our hypothesis is that an increase in UV radiation will change the particle physics of

the minerals and allow them to fluoresce more intensely."

Southeast of St. Louis, Fred Lewis's high school science classes in Marissa, Illinois have packaged six vials of materials to fly with the balloon.

"We tried to choose two types of experiments," Lewis said. "One, materials which might be altered by the UV radiation. Two, materials that might be affected by long-term extreme cold. Then we learned that the samples in flight might reach very warm temperatures on occasion. Now some students are wondering how the warm-cold cycling may affect their experiments."

Projects from the Marissa school include everything from copper sulfate to chewing gum. Students will compare their results with identical samples that will fly on the AHAB high altitude weather balloon.

"There was a lot of excitement among students whose experiment proposals were accepted for flight," Lewis said.

"My project with Aria-9 is dealing with copper sulfate," said student Dawn Hines. "I'm going to find out if it has any effect in making crystals."

Adam T. is experimenting with antifreeze. "Pure Prestone freezes at about -34 F. I hope this doesn't break my little glass test tube. I did leave room for expansion, I just hope it was enough."

Sarah Harkness sent the inner part of a floppy disk. "I saved the TIGER logo on it and want to see that once I put the disk back together if it is still there. I don't think it will be changed very much by any magnetic material around the South Pole."

The chewing gum was put forward by Abby M. "I think that the gum is going to get harder and lose its flavor. We'll find out when it comes back next spring."

See Aria on page 8

Aria From page 7

The Aria-9 project was launched on the balloon carrying the Trans-Iron Galactic Element Recorder (TIGER) instruments and the VHF/UHF Antarctic Impulsive Transient Antenna (ANITA)-lite project. The balloon is provided by the National Scientific Balloon Facility (NSBF), which is funded by the National Aeronautics and Space Administration (NASA) and supported in Antarctica by the National Science Foundation.

The plastic-wrap thin polyethylene balloon launched this year is almost a third larger than the one used in 2001. With a 300-meter circumference, the balloon itself weighs almost 1,360 kg. When inflated, 20 Boeing 747's could fly in formation beneath it. Taller than the Eiffel Tower, the balloon is still visible to the naked eye when it reaches its soaring height of 40km.

Students will be tracking its progress from classrooms all across the country, including the Lab School of Washington, in Washington, D.C.

Anne Runow of the school said students are hoping to track the experiment on the internet.

"We meet every Monday for Sky Science," Runow said. The first and second graders are also learning about Antarctica, its environment and the early explorers.

The Lab School project consists of three vials. "One had salt water in a balloon, a pair of magnets and a red crayon. The second has sugar water in the balloon and two small rocks in water. The third has exposed film with class photos, natural fabric (cotton and silk) and a marker picture of the sun."

Children were asked to predict what might happen to their materials during flight.

"I remember they thought that the film might get foggy, the crayon may melt, the sun picture may fade or turn dark, the water with salt/sugar may crystallize and the rocks may crack," Runow said.

Whatever the level of scientific participation, students involved in Aria-9 will certainly have a better understanding of Antarctica and the science being undertaken here.

Keith Bennett started the Aria program after he returned to Washington University in 1993 after a career in space work on a number of satellite projects. "After a few years doing other things, I decided to get back into space," he said. "I was also trying to find a way to excite kids about science and engineering, particularly space but not just space. I started Project Aria in 1998 primarily as a K-12 outreach program. Since then it has grown to include university engineering education and space-related research."

Other Aria projects involve children with satellite launches, robotics and round-the-world balloon flights. About 50 undergraduate students have been involved each semester since '98.

"The Aria-9 is our first Antarctica mission, although we are hoping to get more in the future," Bennett said.

Claude Larson of Ogdensburg Public School said the students are excited to have this international project opportunity.

"Repeating the experiment was a great way to carry on with the science of the project and carry on the spirit of exploration that we all revered in the Columbia crew," Larson said.

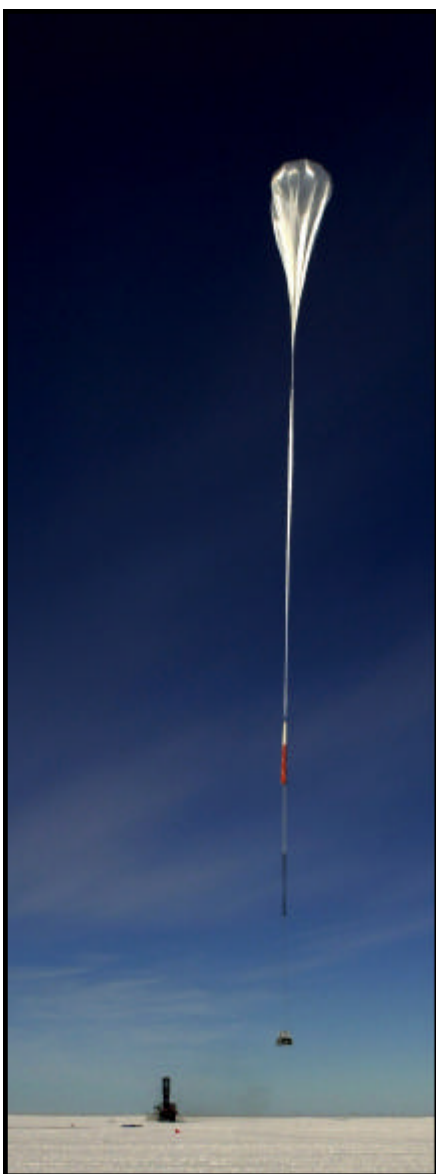


Photo by Melanie Conner / Special to The Antarctic Sun

Above, the balloon carrying TIGER, ANITA-lite and ARIA lifts off from Williams Field. When the balloon reaches the upper atmosphere at an altitude of nearly 40 km the helium will expand and the balloon will expand to the size of a football stadium. At right, spectators watch the takeoff.



Photo by Melanie Conner / Special to The Antarctic Sun

*National Science Foundation funded research in this story:
Dr. Walter R. Binns,
Washington University
Physics Department
<http://aria.cec.wustl.edu/Aria9/default.htm>*

Telescope takes test ride

By Brien Barnett
Sun Staff

This year's goal for the ANITA-lite team is to test a scaled-down version of the instrument planned for launch in three years and check background signals that may affect future data.

"We think we know what the noise level is going to be and we're really looking at what random signals are coming through," scientist Michael Duvernois said.

The full ANITA, an acronym for Antarctic Impulsive Transient Antenna, will use up to 36 antennas suspended over the ice by a long duration balloon to look for pulses of neutrino radio emissions coming through the earth, said Jason Link, another scientist working with the ANITA-lite team.

Neutrinos are thought to hold keys to a better understanding of the early universe because they rarely interact with matter and are not influenced by gravitational and electrical fields in space.

"In the 10 years since I've started, (neutrino research) has gone from an interesting thing to, 'Where have these high-energy particles come from?'" Link said. "They are excellent probes of the very high energy universe."

ANITA is similar in concept and shares the general mission of the Antarctic Muon And Neutrino Detector Array (AMANDA) project at South Pole. Both telescopes aim to detect neutrinos and "look" through the Earth toward the northern hemisphere to detect particles after they interact with the ice.

One of the key differences between the South Pole and balloon projects is that AMANDA looks for visible light emitted when particles interact with the ice on the polar plateau while ANITA will detect radio emissions from the events.

"This is the exact same process except, rather than photons of light, we get photons in the radio spectrum," Link said.

The scale of ANITA also is much broader. AMANDA and its successor will eventually use up to a cubic kilometer of the ice near the South Pole. ANITA will use the ice across large portions of the continental ice as its surface component.

ANITA-lite features two 9 kg, 96 cm antennas to pick up particles with energies equivalent to about a 115 kph fastball, Link said.

National Science Foundation funded research in this story: Walter Binns, University of Washington, <http://cosray2.wustl.edu/current.html>



Photo by Brien Barnett / The Antarctic Sun

A team member works on the ANITA-lite instrument at the long duration balloon facility at Williams Field.



Photo by Melanie Conner / Special to The Antarctic Sun

Spectators watch the TIGER balloon inflate.

Flying TIGER

By Kris Kuenning
Sun staff

The Aria-9 project is a small piggyback on the 1,700 kg Trans-Iron Galactic Element Recorder (TIGER). TIGER is a collaboration composed of scientists from Washington University in St. Louis, California Institute of Technology, Goddard Space Flight Center and the University of Minnesota. Led by Bob Binns of Washington University, this is the second Antarctic flight for TIGER.

The project is collecting samples of rare, heavy particles in galactic cosmic rays. Binns is collecting and analyzing this data to learn more about how stars, like our own sun, live and die. The sampling device, designed by researchers at the Washington University, works best in polar regions.

"The magnetic field of the Earth in the polar region allows cosmic rays easy access compared to more equatorial regions," Binns said.

Two years ago, the TIGER team broke the record for long duration balloon launches with a 31-day, 20-hour flight beginning at McMurdo Station on Dec. 21, 2001. TIGER graduate researcher

from Washington University Lauren Scott said the first launch was successful in collecting about 300 nuclei of heavy elements.

While that data will not provide conclusive answers about the universe on its own, Scott said, "It proved that TIGER is a sufficiently good instrument for looking at these elements. We'll need a good amount of data before we'll have anything conclusive."

TIGER was launched on the afternoon of Dec. 17 from Williams Field outside of McMurdo. An enthusiastic crowd of spectators, including a costumed TIGER mascot, cheered the launch to its prompt departure. That night, researchers stayed up all night tracking the balloon and receiving the initial data. For the first 24 hours of the launch, researchers can tweak the instrument settings through a high-speed connection. Once the balloon disappears over the horizon and the line-of-sight connection is severed, the researchers move to an office in Crary Lab, where they receive smaller bits of data via satellite. Every hour, there is a 10-minute window during which commands can be sent.

National Science Foundation funded research in this story: Dr. Walter R. Binns, Washington University Physics Department <http://cosray2.wustl.edu/current.html> <http://tower.nsf.nasa.gov/ice0304.htm>



Photo by Brien Barnett / The Antarctic Sun

Engineer Gary Kelderhouse and a technician lash down wires around the electronics sphere, which was first flown as the entire payload of several 1960s balloon missions.

Tracer From page 1

“BOOMERANG,” it marks the end point of a previous balloon flight.

TRACER has passed the point on the continent opposite McMurdo and is flying at 80 degrees latitude at an altitude of 39 km. At this rate, the TRACER mission may get a bonus second run around the continent. That would mean more and better data collected by the instrument launched more than a week ago from Williams Field.

The instrument is attached to a helium-filled balloon that grows to the size of a football stadium. At its maximum height the identity of the particles will not be obscured by cosmic ray interactions in the atmosphere that lead to showers of various particles below.

Boyle predicts the winds may bring the balloon back over McMurdo, offering station residents a chance to see the giant balloon in action.

The instrument's primary purpose when floating at nearly the edge of outer space is to detect high-energy cosmic rays. Scientists study cosmic rays to learn more about the violent processes in the universe that accelerate matter to energies many times the magnitude produced by the largest accelerators on earth.

The data will help Dietrich Muller, professor at the University of Chicago and the project's principal investigator, and other scientists find out where high-energy cosmic rays originate. In theory, cosmic rays are particles accelerated nearly to the speed of light by shockwaves of supernovae, or exploding stars. Muller, though, wants to find out if there is a point at which even supernovae no longer can account for the energies of the particles. These very high-speed particles or rays are what he is most interested in detecting.

The instrument is a layered device set inside a rectangular cubic structure. Assembled, TRACER resembles a box-like silver satellite, complete with winged solar panels, which power the electronics inside. However, it's about two to three times as big as a satellite that would typically be launched from a space shuttle or rocket and will conduct its research at a fraction of the cost of a space mission, according to Boyle.

The key to TRACER is that it measures the nuclear charge,

the energy, and the trajectory of each charged particle traveling through the instrument. It accomplishes that task using detectors arranged like layers in a cake.

At the top and bottom are plastic scintillation and Cerenkov counters, devices that help measure the charge of a particle. Beneath the top charge measurement device are four double layers of two-meter-long by two-centimeter-diameter proportional counter tubes set at different directions per layer. The tubes are made of mylar and contain a thin wire surrounded by xenon gas. Particles traversing the tubes liberate electrons in the gas which move toward the wire, generating avalanches of secondary electrons near the wire and hence, electric signals which characterize the nuclear charge and energy of the particle.

Below, there are further layers of tubes alternating with layers of plastic fiber radiators. Altogether, there are 1,600 tubes.

Strapped to the outside and below the central box are a variety of navigational and communication systems. One antenna allows the team to collect as much data as a high-speed business Internet connection when the balloon is within range of McMurdo. After that, another antenna transmits small amounts of data to a satellite, but only for about 20 hours a day. All the data is stored onboard and will be retrieved. Ideally the payload will be jettisoned somewhere close to McMurdo and will parachute safely to the surface and be retrieved.

The instrument is suspended from the balloon by a rotating device that will keep an array of solar panels and shields facing the sun. Because the instrument will be flying at the height of the atmosphere, there is little air or wind. To ensure a stable temperature, engineers have enclosed it with plastic foam insulation and thin metal panels covered with expensive, reflective, breathable tape.

Most of the sensitive computer electronics are set within a small pressurized sphere carried underneath the main instrument. The sphere is a piece of history, said Gary Kelderhouse, an engineer with the TRACER project.

The sphere was originally designed for a project to detect electrons called “e-plus-minus.” Kelderhouse said it was flown on several missions back in the early 1960s. It was designed to hold the entire payload on a scientific balloon. While working on TRACER the team found it in the basement of their building and realized it would work for their mission.

TRACER was originally designed to fly in the Arctic. However, negotiations for flyover rights broke down and eventually the project was moved to Antarctica. Muller said that's better for the project anyway for several reasons. An obvious one is that nobody owns Antarctica and flyover rights are not at issue. More important, though, is that the atmosphere above Antarctica provides a more stable temperature environment for the balloon. Also, the constant daylight and circumpolar wind tend to keep the payload over Antarctica for a long time. Typically, a balloon flight will take two weeks to circle over the continent.

The experiment, which is funded by the National Aeronautics and Space Administration and supported by the National Science Foundation, is a follow-up study similar to one conducted by Muller's group aboard the shuttle Challenger in 1985.

“There's some hardware in there that was originally flown on the Challenger in one of the last missions before it blew apart,” Muller said.

The Challenger experiment provided much of the current data about cosmic rays at super-high energies, according to Muller. If successful, TRACER should greatly extend that body of knowledge.

National Science Foundation supported research in this story: Dietrich Muller, University of Chicago, Enrico Fermi Institute, <http://tracer.uchicago.edu/>, <http://tower.nsbfnasa.gov/ice0304.htm>



Left: Construction workers fix steel beams into place at the new Amundsen-Scott South Pole Station.

Photo by Kris Kuenning / The Antarctic Sun

Right: The 92 stairs of the "beer can" connect the new station to the old dome.



Photo by Kris Kuenning / The Antarctic Sun

Adrienne Gass, center with glasses, passes a box of kitchen supplies from the second floor landing. In the transition phase, food is lifted to the new station dining facility by forklift and then passed by hand to the kitchen.



Photo by Kris Kuenning / The Antarctic Sun

Dome From page 1

Emanuel said.

"That's part of the pain of the transition," said Jerry Marty, National Science Foundation representative at the South Pole. "There is always going to be a certain amount of operational inefficiencies as we are phasing into the new facilities."

With more than 200 South Pole residents, including 94 construction workers, not everyone has a room in the new station. And not everyone wants one.

Some have opted to live under the Dome. The rooms are tiny. The walls are thin and the bathroom is unisex, but the experience under the Dome will not be available much longer.

Summer camp at the South Pole includes a series of Jamesways and Hypertats. Both are temporary semicircle structures with small rooms partitioned by blankets in the Jamesways or cardboard dividers in the Hypertats. Hypertats are connected to bathrooms by a covered, but unheated, walkway. A late-night trip to the toilet from a Jamesway requires several layers of cold weather gear.

Construction coordinator Doug Forsythe could have had a room in the new station, but after 10 seasons in the same Jamesway, he felt more at home in summer camp.

"I'll take my old J-way anytime. I have it fixed up the way I like it," Forsyth said.

Residents of the new station may be comfy and close to the dining facility, but until the next wing is occupied, they still

have to carry their laundry to the Dome or the summer camp.

Forsythe describes the transition phase as "kind of like having a brand new house ,but still attached to the old cabin."

Living between stations also makes for a dichotomy in the social environment. The bright new dining facility has a bar at one end, which provides a contrast to the dimly lit bar under the Dome. Social gatherings are split between those two venues and the summer camp lounge.

"Many people have commented about how quiet the Dome area and Dome living has become," Forsythe said. "It's definitely not the upbeat, exciting place it use to be."

If all goes as planned, the third wing of the station will be occupied in February, bringing the computer lab, store, post office, clinic, laundry, reading room and greenhouse under the same roof. Marty said the move will make for a more efficient operation.

And there will be fewer reasons to climb the 92 stairs of the stairwell in the circular metal structure referred to as the "beer can" and traverse the tunnels to the old Dome.

Emanuel reports lots of "out of breath panting in the lunch line" from the "beer can" climbers.

There are other unexpected features of the new station. "Like how the building sways a little in a strong wind," Emanuel said, "and how the sunny back decks are so warm because they are on the downwind

side of the building (I've heard rumors of lawn chairs next year)."

"I feel very fortunate to be here during the building transition phase," said janitor Susan Weber. "In the short term, there's some inefficiency and inconvenience, but in the big picture, progress is being made."

The summer crews are working to get two new sections enclosed so that winter staff can start the inside fitout of the administration and communications facilities, housing and emergency power plant facilities. The new science wing, enclosed last year, should be ready for occupancy in 2005. An increase in the number of scientists at the South Pole was the push behind the construction of the new station in the first place, Marty said.

"This new facility is a quantum leap forward. It's all about supporting science," he said. Built in the early 1970s and occupied in 1975, the Dome was designed to house 18 people in the winter and 33 in the summer. The new station will house 150 people, including 75 scientists and 75 support people in the summer and a total of 50 in winter. Marty has been a part of the construction project since the planning stages. This is his 10th consecutive season at the South Pole. It is exciting to be using the new station, he said, despite any transitional difficulties.

"I always wanted to be part of this project," said Marty, who first came to Antarctica as a general field assistant at Byrd Station in 1969. "It's very historical."

Profile

John Evans:

Mountains and miracles

By Kris Kuenning

Sun Staff

Whether he's charging up Antarctica's highest peak or moving scientific equipment to a remote field camp, John Evans has a reputation as a workhorse, storyteller and sometime miracle-worker.

The U.S. Antarctic Program's coordinator for special science projects is quiet and unassuming in the paper-piled cubicle of his Denver office, but colleague Melissa Rider illustrated his character with a recent story she had heard from the field. Evans was helping to put in an island-based field camp when the motor on the inflatable boat popped off its mount and sank under the rough seas.

"Without hesitation, John marched into the chest-high surf, ducked under the waves, and single-handedly retrieved the engine, placed it back on the Zodiac and continued back to the shore where he commenced the regular off-load duties," Rider wrote from the research vessel *Laurence M. Gould*. "Nary a thought in his mind he'd just saved the day and performed a partial miracle."

Evans works to make Antarctica's most inaccessible research grants possible. He is responsible for all the projects that can't be run from one of the program's permanent research stations or vessels.

Evans has experienced Antarctica in ways few other people have, including from the summit of its highest peak. Just two years after working in the Ellsworth Range as a geology graduate student, Evans was chief scientist of the first party of mountaineers to climb Vinson Massif in 1966. The team also scaled the other three highest peaks in the range, including the more challenging Mount Tyree. Their climb of Vinson was not repeated for almost 20 years.

Evans did not go on to a career in science. He never finished his PhD work in X-ray crystallography. "I got distracted," he said. Instead, he has had a varied career, including a stint at NASA and 10 years with Colorado Outward Bound, followed by what his wife Loie calls "the biggest wilderness experience of John's life – working in a bank in downtown Denver."

In 1991, Evans was rescued by another Antarctic opportunity. He was sought out to help coordinate a large project in the icy Weddell Sea.

"They found me at the bank, with my face pressed against the glass," Evans said.

After an 18-month contract, Evans filled several other temporary contracts until, in 1997, a permanent position was created for coordinating special science projects. Evans has filled that role ever since.

"There was a real need for someone to manage these projects and I happened to have a real need for a job," he said.

This year, the number of projects he manages has grown to nine, so he's passing some of the work to colleagues Melissa Rider and Toby Kauffman.

Evans loves his job. And it seems a perfect combination of his outdoor skills and love of science.

Pushing Zodiacs through broken sea ice or belaying fossils down steep slopes, the 64-year-old enjoys the annual escapes from his Denver desk. In the field, Evans has a reputation as a tireless worker and inspirational companion.

"John has incredible stamina. He will work tirelessly. Mere mortals could never keep up," Rider wrote.

"When there's gear to be moved, John's back is about all you



Photo courtesy John Evans

John Evans at the summit of Vinson Massif in 1966, wearing the sorority sweatshirt of his then-girlfriend, now wife of 30-some years.

ever see because he's out front with the biggest load," said Steve Ager, a marine projects coordinator on the *Gould*.

"Both his professional and personal life experiences are a huge asset to his productivity," Rider said. "He has a depth of character that seems to be instantly recognized by his audience. He inspires confidence in those he works with. His charisma spans the age and nationality ravines that often hinder people."

Who better to explain this depth of character than Evans' wife Loie. The couple met through Loie's brother, who shared that first Antarctic season with John.

When Evans climbed the Vinson Massif he took a photo at the summit wearing the perfumed sorority sweatshirt Loie had sent along with him.

Loie remembers the year John got back from Vinson, "There were lots of visits that year between CU and the U of Minnesota and John asked me to marry him late that summer of 1967."

Since then, the couple have shared a life full of adventure, including the birth of two children and the sad loss of one of them, their son Barry in 1992.

"I know that all of these experiences have helped to shape and mold John in wonderful ways, but the basic kind, ethical, principled, strong, gentle, humorous person has always been there," Loie said.

"He has an amazing strength – physical and inner, which seem to enable him to always get tough jobs done with a wonderful sense of enthusiasm. He has an amazing tolerance for cold, tough work and for helping others succeed in some challenging situations."