December 3, 2006

The Antarctic Sun

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

Closed case

Scientific consensus is that global warming is a fact, so why does America think it's still being debated?

By Steven Profaizer
Sun staff

The debate raging among scientists over the existence of global warming isn't actually raging these days, but that news is still trickling down to non-scientists.

With misconceptions of the subject so prevalent and with the success of films like Al Gore's documentary, "An Inconvenient Truth," some scientists are re-evaluating the way they share their findings with the public.

"It gets frustrating for scientists to see the 'debate' over global warming represented in a 50-50 sort of way," said Ross Powell, co-chief scientist of the ANtarctic geological DRILLing (ANDRILL) project. "Because, as presented in former Vice President Al Gore's movie, the majority of scientists who work on any aspect of this believe it's happening and know what the significance of it is."

The question of global warming has been examined by more people in more countries and in more scientific fields than

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Photos by Cara Sucher / Special to *The Antarctic Sun*

Two photos show the collapse of a section of the Marr Ice Piedmont glacier that connected Norsel Point to Anvers Island, the location of Palmer Station, in January 2004. It took several weeks for the complete collapse to occur. The glacier is steadily receding.

Courtesy of Kaneen Christensen / Special to *The Antarctic Sun*

A low sun backlights the drilling rig working in the Taylor Valley to clean out the No. 6 borehole from the Dry Valley Drilling Project.

USAP plugs away at environmental issues in valleys

By Steve Martaindale
Sun staff

Mankind has a rich history of being hard on the land it calls home. The same can be said about the short time that humans have explored Antarctica, but the seventh continent is benefiting from what its current occupants have learned from their past.

It is being cleaned up before widespread damage is done, and new practices limit impacts on the environment.

"We are getting it dialed in as far as how we've impacted [the environment] and how to mitigate those impacts," said Kaneen Christensen, environmental engineering supervisor for Raytheon Polar Services Co.

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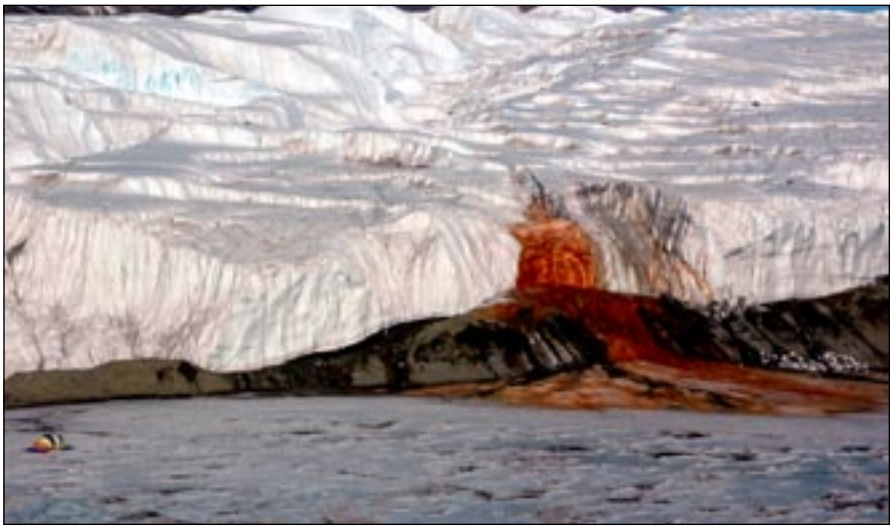
INSIDE

Quote of the Week

"It's 10:59 – two minutes away from the thundering herd."

– Man commenting on clockwork arrival of lunch crowds.

A Varied Landscape



Photos by Peter Rejcek / *The Antarctic Sun*

The McMurdo Dry Valleys, left, is an important site for scientists to study because of its unique geologic, biologic and chemical processes. Blood Falls, above, is one such feature, which researchers believe is caused by seawater trapped beneath Taylor Glacier. The red color is a reduced form of iron.

Cold, hard facts

Summing up science

Total number of science events for the 2006-07 season: **108**

Number of staffed field camps: **4 (Lake Hoare in the McMurdo Dry Valleys, Taylor Dome, Siple Dome and WAIS Divide Camp)**

Number of USAP special projects requiring support outside normal station and vessel operations: **7**

Number of Antarctic Artists and Writers Program grantees: **5**

Science event with the coolest acronym: **BLAST (Balloon-borne Large Aperture Sub-millimeter Telescope)**

Event most likely to revive the Age of Aquarius: **Stellar Axis, an art expedition to trace the star patterns above Antarctica on the summer solstice.**

Source: USAP Science Planning Summary

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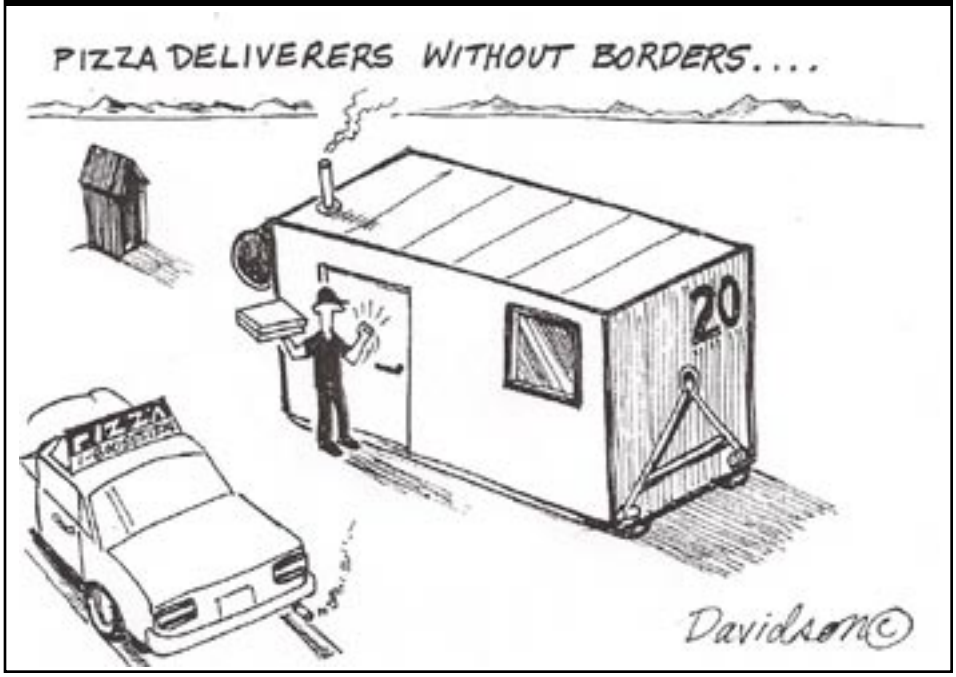
Level 1 Comix **Matt Davidson**



Chaplains unite to serve Ice community

By Steve Martaindale
Sun Staff

As this year's summer season was about to get started in Antarctica, an annual ritual was repeated in downtown Christchurch, New Zealand – the asking of God's blessing on all of those heading south to work on the Ice. One tradition, relatively new but steeped in symbolism, was fulfilled when the Erebus Chalice was handed over for its trek to McMurdo Station.

The silver chalice is passed from Christchurch Cathedral in New Zealand into the care of a Protestant military chaplain from the United States, binding together people of different nations, faiths and walks of life.

That same unifying spirit is embraced by the chaplains who are charged with caring for the chalice and ultimately returning it to its winter home in Christchurch Cathedral at the close of the season.

A recent chat with the Revs. Bill Yates and Dan Doyle in the Chapel of the Snows continually touched on the themes of unity, diversity, cooperation and an all-inclusive concept of caring for their community.

"We're now at 50 years of this very unique ministry of Catholics and Protestants working together," said Doyle. "It doesn't happen just about anywhere else in the world that we know of, that they share a church and share a ministry and share the care of the community."

The most dominant message, though, was that chaplains are not here just to lead worship services.

"There's probably a certain measure of misunderstanding or inexperience with what a minister, priest or a chaplain does – what they're all about," said Yates. "Some people may think, 'Well, a chaplain is down here simply to serve religious people.' That's not entirely the case. We're here to serve everybody."

"As an American military chaplain, I deploy to ensure that our people can freely exercise their religion as guaranteed by our Constitution," he continued. "In addition to that, we serve people of all backgrounds, even those who do not have a connection to God, per se. We are truly here to serve all people, whatever their needs might be."

Steve Martaindale / *The Antarctic Sun*

The Revs. Bill Yates, left, and Dan Doyle hold the Erebus Chalice, which spends austral summers in the Chapel of the Snows at McMurdo Station and winters in Christchurch Cathedral in Christchurch, New Zealand. Protestant and Catholic chaplains have worked side-by-side for 50 years serving the Antarctic community.

The austral summer season always has two chaplains on the Ice – a Protestant from the U.S. Air National Guard and a Catholic priest from New Zealand. Each is on the continent up to two months as three Protestant and five Catholic chaplains serve together over the course of the season. In fact, Yates had only a few days left on his third trip down when he was interviewed. (Taking the second Protestant rotation is the Rev. Rafael Marquez.) Doyle, on his 11th trip to Antarctica since 1984, had recently arrived in relief of the Rev. John Harrison. They are stationed at McMurdo but also make monthly trips to the South Pole. Additionally, they offer their services to nearby Scott Base and have lunch at that New Zealand station once a week.

Yates and Doyle said one of their most significant roles was as counselor.

"Anybody that would like to have a confidential listening ear can come here," Yates said. "We talk about all kinds of issues – marriage, family, work, spiritual issues, any concerns that they may have about what is going on here or at home."

They also host Bible studies and fellowship groups, along with religious services. They maintain a collaborative relationship with the clinic in case a patient needs pastoral care. They attend town meetings and work with station leaders on special projects. Both chaplains took part in the recent MCI (mass casualty incident) drill. They work with peer counselors at the station, training and supporting them. Yates also carries particular duties as part of his military position.

Like many in Antarctica, the two pastors said they find particular awe and pleasure in the harsh environment and the people who choose to come here.

"People who come down here can have quite a spiritual experience just by being overwhelmed by the power of the Lord in this environment," Doyle said. "People can be open and look at things in a different way."

Yates explained the diversity of people here by describing them as a jewel.

"It's as if the light and uniqueness of God's creation focuses through one point – and then it just refracts into a variety of colors and images and reflections of God's handiwork. I found the people here so stimulating, so interesting and so unique. I don't think there's as unique a collection of people on planet Earth as you'll find [in Antarctica] in any given year."

A Day in the Life

Perspectives

Slingbacks get the boot for kitchen clogs

By Monica Piergrossi
Special to the Sun

Shoes. That's what comes to mind most frequently when I think about being here in Antarctica and the whole "Ice" experience. One would think that with the amazing sea icescape, snow-capped mountains, whipping wind, the groundbreaking research, and an active volcano so close, shoes would not be one of my foremost thoughts.

It all started one summer eve at a great little Cuban place in Denver with one of my good girlfriends, an enduring fashionista formerly of L.A. Our conversation drifted from serious to silly and landed, as it always does, on shoes … what shoes will you bring for your adventures in Antarctica and your tropical travel afterwards?

Shoes, shoes, shoes. Love shoes. Shocker! Many women do; perhaps it's the variety. It can be a stretch, but variety does exist even on the Ice – which safety work boot or slip-resistant kitchen shoe will you choose? Will you go with the rocking "KISS" blue snow boots or the classic bunny boot?

Last year a U.K. study found that the average woman of average income in developed countries will spend more than £30,000 (about $59,000) on shoes in her lifetime. Now, my collection is not that Imelda impressive or Ivana expensive, but what I did find as I packed up my shoe closet before deploying was that all my shoes tell a story and remind me of the paths I have walked in my life thus far.

Packed away are my alpine ski boots that I usually spend an average of 50 days a year in escaping the craziness of life and enjoying fresh, quiet turns in Colorado powder. I had to say goodbye to my worn and tattered cowboy boots that have been to more public hearings, county fairs and festivals, coffee shops, and town hall meetings in rural and suburban Colorado than I care to acknowledge.

Over the last few years, the boots and my slingbacks have been my uniform, my power-handling shoes, as I worked inside of the system as a communications director with the Colorado House of Representatives. At the House, I helped coordinate policy agendas, spin media, lobby for and draft amendments, organize events and committee meetings, and serve as a handler for a 35-member political caucus.

I spent much of my work time over the years organizing, fund raising, and managing citizen education, ballot issues, candidates and media campaigns. It was a treat to tackle timely and crucial issues like water rights, dams and instream flows, transportation and land use plans, women's issues, and preservation of the natural and recreational values found in the wild, special places around the West -- and my trusty boots were always the best style choice to get the job done.

I'm already missing my old, ratty, but favorite reef flip-flops, which have been demoted to gardening flip-flops lately but have been my foot apparel choice for so many good times: desert river trips, camping, walks in the park, beach trips, barbecues and drinks on the patio. But, wait, I can't forget the shiny black, pointy toe-heeled boots, the urban cowgirl boots or the classic black slingbacks. Will I miss them?

Paul Lackey / Special to *The Antarctic Sun*

Monica Piergrossi still fawns over footwear in the less fashionable Antarctic.

My campaign lifestyle was rewarding but draining and after 12-plus years of it, I needed a little break or an opportunity like Antarctica to be a catalyst for my next path in life. I suspect I'm not alone; perhaps Antarctica is a vehicle for transition for many of its participants – a transition in life, research work, trade skills, or simply a desire to mix it up. The diverse people of Antarctica, most of whom have walked many paths in their own lives, are inspiring and that's been one of the most interesting things about being on the Ice.

My own transition from slingbacks to safety-first kitchen clogs was shocking but welcome, as I joined the proud, willing, educated, multi-lingual, diverse, creative and some of the nicest people on station – the blue-shirted dining assistants. Most blue shirts have washed dishes and worked in food service before; it's just been longer for some of us than others.

Sure, I still think and strategize about current events in my head and how I would have handled that sticky situation with the media or how we could have gotten the last vote for a particular bill.

Nowadays I am happy to keep my thoughts floating around … "Do I have enough soap in my sink? I should really pay some bills back home. When can I see a seal next? Running low on small spoons again? When will the sea ice break apart into mini icebergs? Real cheese! Can we really cross the Cambodia/Vietnam border via boat on the Mekong? Can't wait to hike again soon. Must see penguins! Will our dollar stay strong for our traveling adventures? What makes blue sanitizer so magical? Three-and-a-half-inch-wide skis are just wrong. Why can't I stop eating the super good homemade bread the bakers make everyday?

"And, oh, which pair of shoes should I wear right now?"

Monica Piergrossi most recently worked as a communications director with the Colorado House of Representatives. She has been reborn in Antarctica as a dishwasher, serving McMurdo as a dining assistant.

around the continent

PALMER

Treaty inspectors hit town

By Kerry Kells
Palmer correspondent

The first cruise ship of the season visited Palmer Station last Thursday. The *M/S National Geographic Endeavour* arrived in the afternoon and 113 passengers received tours of the station.

The *Endeavour* crew invited Palmer community members to join the passengers onboard for the evening. On board this cruise was National Geographic photographer Paul Nicklen, whose photographic feature on leopard seals is on the interactive National Geographic Web site. We also joined in the celebration of the release of Lisa Trotter's book on diving in the Antarctic. Trotter, the vessel's assistant expedition leader, has visited Palmer many years with the *Endeavour*.

Gitte McDonald, a scientist waiting to get to Cape Shirreff but delayed due to high winds, hosted our weekly science lecture. She spoke about the research of Southern elephant seals as well as her thesis on Antarctic fur seals at Cape Shirreff. In 2005, scientists attached satellite relay data loggers to six elephant seals. The following year, 12 seals were caught for the project. In this way, researchers can measure foraging strategies and dive depths as well as collect oceanographic data.

Cape Shirreff is located on the tip of Livingston Island and is the site of 2,000 breeding female Antarctic fur seals. These seals return to the same location to breed and raise their pups each year. Because the seals return to this location, McDonald's research group is able to tag and age female seals and pups. They can also track, among other factors, the seals' reproductive history, growth rates, milk energy intake and foraging behavior. Since 1997, the researchers have tagged 500 pups a year.

Hugh Ducklow, the principal investigator (PI) with the bacteria component of the Long Term Ecological Research project (LTER), and Maria Vernet, the PI with the phytoplankton component of LTER, recently departed Palmer.

The bird researchers have begun collecting shells from Adélie penguin eggs taken and eaten by skuas on the local islands. The eggshells are collected for colleagues of Principal Investigator Bill Fraser. The collections of penguin eggshells will range from a sample area on the peninsula that includes Palmer Station, King George Island, Petermann Island, Cape Shirreff, Bird Island, Signy Island, and from other locations accessed by the *Endeavour*. The shells will be analyzed for stable isotopes. And our other LTER researchers continue to sample at Station B (just off Bonaparte Point, a few minutes from Palmer) and Station E near the two-mile boating limit.

Palmer Station celebrated Thanksgiving with a feast and fancy dinner last Friday night. Southwest winds brought some loose sea ice into the area the next day but the ice did not stay long. We enjoyed our two-day weekend with some recreational boating, camping and trips to the backyard and up the glacier.

Phil Spindler / Special to *The Antarctic Sun*

Seabird researcher Kristen Gorman, based at Palmer Station, sorts penguin eggs destroyed by skuas, a seabird found in both temperate and arctic regions.

SOUTH POLE

Holiday meal no mean feat

By Susannah Coates
South Pole correspondent

How lovely it has been to have the prospect of a two-day weekend before us! Now that we're past the euphoria of station opening (or was that the hypoxia?), the station has settled into its groove. The hours have been long, and a two-day weekend was a treat to look forward to – that,

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the week in weather

McMurdo Station
High: 39 F / 4 C
Low: 10 F / -12 C
Max. sustained wind: 28 mph / 45 kph
Min. wind chill: -20 F / -29 C

Palmer Station
High temperature: 43 F / 6 C
Low temperature: 25 F / -4 C
Max. sustained wind: 19 mph / 31 kph
Melted precipitation: 2 mm

South Pole Station
High: -12 F / -24 C
Low: -37 F / -38 C
Peak wind: 24 mph / 38 kph
Max. physio-altitude: 3,217 m

Continent From page 5

and the outstanding Thanksgiving dinner, staged by Executive Chef James Brown and his band of helpers.

The people on station who track supplies started pulling food out of cold storage a week before the big event.

This is no mean feat.

The turkeys alone led them and three cargo handlers on a merry, two-day chase through the supply berms, digging snow out from around the huge crates to see their inventory numbers and find if perhaps *this* box contained the elusive 400 pounds of birds.

The team didn't have a choice but to find the turkeys at the beginning of the week. Thawing that many turkeys from negative 50 degrees F takes a while.

With the weather toying with the flight schedule, anxiety began to bloom. Would we be able to get fresh fruits and vegetables in for the holiday meal?

On Wednesday, everyone in the cargo office cheered at the news that a crate of them was coming in on one of the flights. (We had watermelon at breakfast on Friday! Oh, the bliss!) And on Friday afternoon, volunteers and workers formed a human chain up the front steps of the station to get the new beverages inside before they froze.

Volunteers came out of the woodwork this week, eagerly taking on the tasks involved with staging the holiday meal. As soon as brunch ended on Saturday, they descended upon the dining hall and prepared it for the special occasion.

In the evening, they draped white cloths genteelly over their forearms to serve wine and later reappeared bearing pie and whipped cream.

Afterwards, they donned aprons and scrubbed pile after pile of baking and serving pans, pots, plates, glasses, silverware, cutting boards, butter dishes, and more plates, glasses and silverware.

The dinner itself proved an unmitigated success and spirits ran high. Revelers lined the long, white-cloth covered tables, dressed to the South Pole nines. An opening toast to the dining hall team brought loud and prolonged cheers of approval. The second toast to family at home and on the Ice, though more subdued, was equally welcome. And it was that first bite of turkey and stuffing that really made it Thanksgiving.

SHIPS

NBP

Compiled from reports by "Skip" Owen
Marine Projects coordinator

High winds continued into the morning hours of Nov. 21, forcing the *R/V Nathaniel B. Palmer* to the south of the Ross Ice Shelf. Once in the lee of the shelf, the *NBP* conducted several conductivity, temperature and depth (CTD) casts. Winds lessened the following day, allowing for deep and shallow CTD casts.

On Nov. 23, the vessel headed toward Beaufort Island, about 20 kilometers north of Ross Island. Tight pack ice and pressure ridges, with few open leads through the ice, hindered the trip. After a brief stand-down on Thanksgiving Day, the ship moved north again and began an easterly transect, with CTD casts every 50 kilometers, for several days. Trace metal casts for two of the CORSACS scientists were made on Nov. 27.

The vessel was scheduled to rendezvous with a helicopter from McMurdo Station on Dec. 1 for one passenger to disembark with gear. The ship will then head north toward New Zealand, with arrival in the port town of Lyttleton scheduled for Dec. 16.

LMG

Compiled from reports by Herb Baker
Marine Projects coordinator

The Antarctic Treaty inspection team aboard the *R/V Laurence M. Gould* continued its tour of the Antarctic Peninsula during the past week. By Nov. 22, the ship arrived at Neko Harbor, where it met the *M/S National Geographic Endeavour*. One of the *Endeavour's* Zodiacs transported the inspection team over. Neko Harbor is a stunning place to see. The cold, clear and windless day was as near to perfect as you can get.

The next day found the *LMG* at Chile's O'Higgins Base, where the inspection team transferred via Zodiac. The tour of Antarctic stations continued on Nov. 24 with a visit to Argentina's Esperanza Base.

The next morning, the *LMG* arrived at Deception Island. After a brief visit to Pendulum Cove, the inspection team began its first tour of the day in Whaler's Bay by reviewing a cruise ship and its landing process on the beach. The inspection team reviewed a second cruise ship in Whaler's Bay on Nov. 26.

The treaty inspection team then inspected two stations on King George Island – one at Bellingshausen (Russia) and one at Great Wall (China). All went well, and the ship is now under way to Punta Arenas, Chile.

Continental Drift

What extra item did you pack for the Ice and why?

"My distortion pedal, because it screams."

Jay Fox
McMurdo Station
retail supervisor
Washington, D.C.
ninth season

"I brought lots of chapstick because sometimes in Antarctica my lips hurt REAL BAD!"

Tristan Wohlford
Palmer Station
field team leader
Greenwood, S.C.
second season

"My inflatable ride-on ostrich for special occasions."

Tony Hunter
South Pole
cargo senior
Denver, Colo.
fourth season

Global warming

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any other scientific question in history, according to Hugh Ducklow, principal investigator for the Palmer Long Term Ecological Research project.

"The consensus among that group is overwhelming," he said. "This issue is closed. It's an open-and-shut case as far as scientific opinion goes."

If the case is closed, why are only four in 10 Americans very sure global warming is occurring, according to a 2006 benchmark survey by ABC News, Time magazine and Stanford University?

Filtered facts

Scientific papers are not sexy. They don't get passed around as e-mail forwards. They don't make the *New York Times* Best Seller List. But they are where most news about science originates.

The traditional route for the spread of science news begins with scientists. They conduct their research and then try to get that information published in science journals. From there, the mass media surveys the information and, if they find it worthy of sharing, pass it on to the public.

This gauntlet prevents information overload, but it also places people other than the scientists in charge of getting findings to the masses.

"Several of us are starting to rethink that model," said Ken Taylor, principal investigator for the West Antarctic Ice Sheet ice core drilling project. "I used to think that scientists didn't have to worry too much about communicating to the public; that was somebody else's job. It's obvious that there are a lot of people that either don't know what they're talking about or are intentionally manipulating the story. With that in mind, I think scientists have a much stronger obligation to take control of the story and get the story out themselves."

One of the classic examples of this technique is RealClimate.org, he said. The site allows a team of scientists to comment on global warming research and media coverage in a casual and more reader-friendly way than peer-reviewed papers offer.

"When you communicate science to the public, there is a public threshold of

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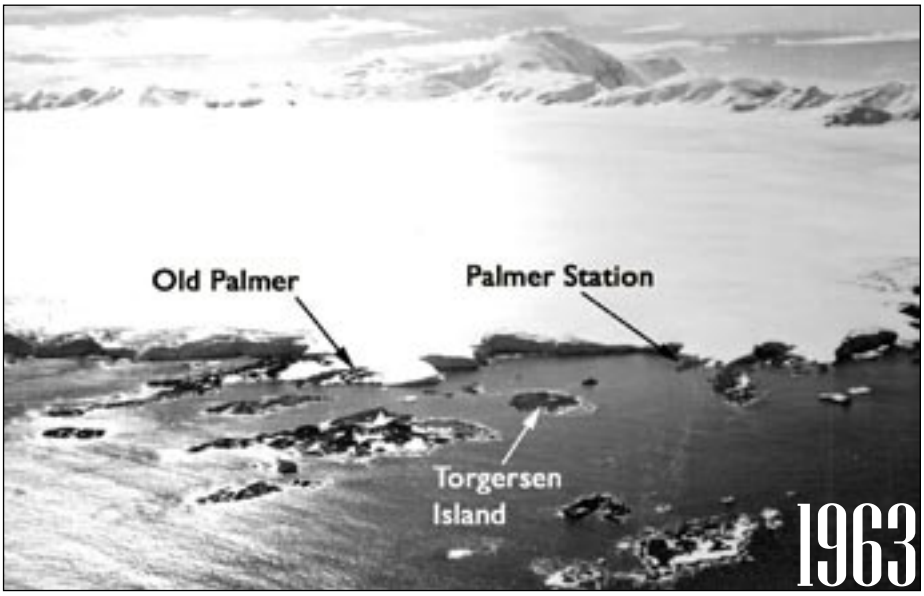
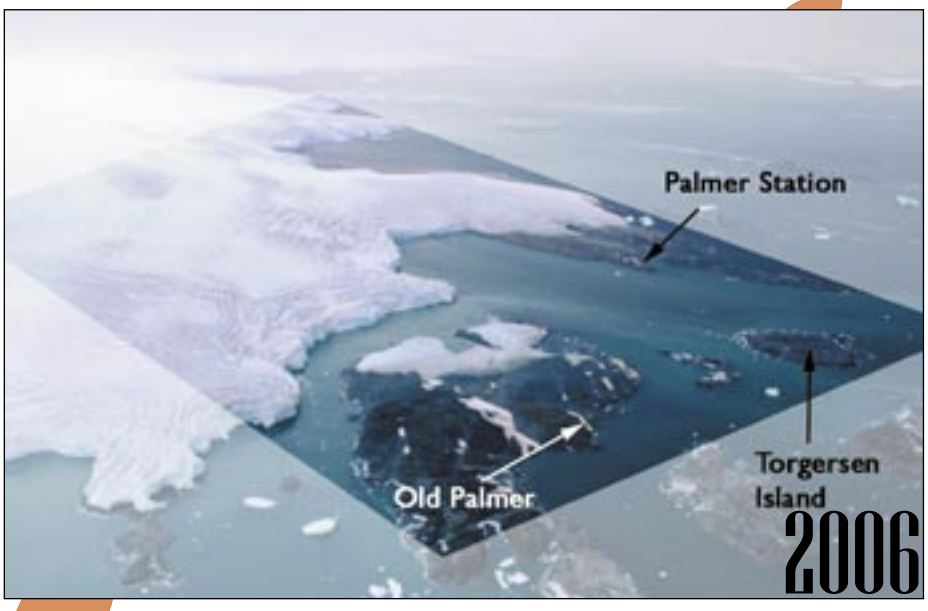


Photos courtesy of Curt Smith / Special to *The Antarctic Sun*

"The Antarctic Peninsula region is warming as rapidly as anything on the planet. This area is **virtually on fire** in terms of climate warming. ... Going from the bottom of the food chain all the way to the top, we're seeing changes that are related to **climate change** in this region."

– Hugh Ducklow, Virginia Institute of Marine Sciences



There are a **few outliers**, but if we have to wait until we have **every** scientist on board, we'll never get anywhere.

– Ken Taylor, Desert Research Institute

Global warming

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science literacy, so the communication has to be on a certain level," said John Jackson, education and public outreach coordinator for ANDRILL. "I think one of the major challenges is to communicate to the public who scientists are and what scientists do. I'm not so sure if the public has a good understanding of those two things – especially when it comes to … cutting-edge science."

Antarctic scientist Sridhar Anandakrishnan hopes to help reveal that information in a new way. He has applied for a National Science Foundation grant to organize a film crew to travel to Antarctica and create weekly podcasts, videos intended to be freely distributed via the Internet and viewed on computers and mobile multimedia devices.

"The primary way to get scientific information out there is always going to be through print and writing articles, but hopefully this is a very powerful way through a new medium," he said.

The process of refining

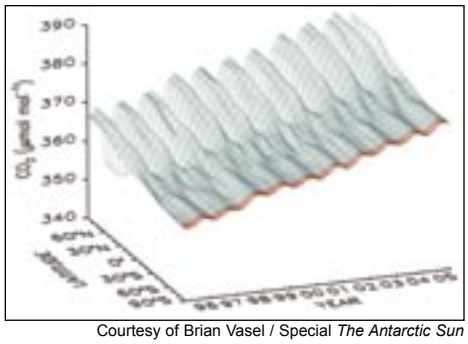
The scientific learning process can prove to be another major obstacle. It is complicated and typically involves fine-tuning, which can appear to be a lack of understanding.

"It frequently takes three steps forward and one step back," Taylor said. "The public often gets confused when we make changes to previous work. Sometimes there will be two studies that come out, and there's a little bit of disagreement. The public might say, 'Oh, these guys don't really know what they're talking about.' In reality, the scientists might agree on 90 percent of the information and are just still refining the last 10 percent."

This process is an integral part of science. Scientists don't study things you find in a textbook. By the time a theory is that established, research scientists are bored with it, Taylor said.

Instead, scientists wander around on the cutting edge, constantly refining their understanding. This is where you can find the study of global warming.

The overwhelming majority of scientists have left behind the debate regarding the existence of global warming and are now discussing its magnitude and consequences, said Doug MacAyeal, principal investigator on a project studying the breakup of icebergs.



Courtesy of Brian Vasel / Special *The Antarctic Sun*

This NOAA graph shows the increase of carbon dioxide (CO_2) in the Earth's atmosphere over the last decade. CO_2 is the primary greenhouse gas contributing to global warming.

"It still isn't clear what [global warming] means for a given region, a given glacier, a given swampland, a given process or a given population," he said. "Those types of uncertainties don't change big-picture global warming."

A complicated balancing act

Global warming has proven to be one of the few scientific debates to happen in the headlines.

Journalists are charged with bringing balanced news to their readers and viewers. Fulfilling that duty while giving an accurate representation of the global warming debate can be a confusing and challenging process, MacAyeal said.

Science debates aren't a natural fit into the journalistic mold.

"I think it's healthy to have debate," Powell said. "But the debate has to be with appropriate people and with appropriate data. I think that very often the appropriate people or appropriate data aren't used."

Taylor explained that journalists often seek out a scientist who is part of the minority that disagrees with global warming in an effort to tell the "other side of the story." This typically lends more weight to their argument and adds more confusion to where the issue stands in the scientific community.

"Sure, there is always the possibility that there will be this voice in the wilderness that tells the truth that we didn't notice," MacAyeal said. "But if you argue global warming is invalid, you have to throw away so much of what we know about the climate and the paleoclimate and how the ice age ended. It would say that we've been failures for the last 50 years and haven't really learned anything."

"I'm **not interested in the debate** anymore. I won't read articles on the debate. I've come into acceptance, and I think it's **only a matter of time** until everyone accepts it."

– Doug MacAyeal, University of Chicago

Moving forward

The existence of global warming is no longer a scientific question, MacAyeal said. And while scientists can help the public better understand the issue, he said it is time for the research to move forward.

"Global warming isn't just about turning up your air conditioning a little bit," MacAyeal said. "The world is such a complex, interconnected system, and we've only yet scratched the surface. … That's where I think the real science of this issue will be in the future, not in endlessly coping with this debate."

It's a balance of education and continuing research that Taylor said he feels is important, because a lot of people are not going to believe the science models.

Global warming will keep creeping forward and one day people will look around and realize that it has already changed the world they live in, MacAyeal said.

"It won't be a 'Day After Tomorrow'-type scenario where after the great apocalypse, people are stumbling around in the wreckage saying, 'Yep, I guess I believe in global warming now.'"

NSF-funded research in this story: Doug MacAyeal, University of Chicago; Hugh Ducklow, Virginia Institute of Marine Sciences, www.icess.ucsb.edu/lter/lter.html; Ross Powell, Northern Illinois University, andrill.org; Ken Taylor, Desert Research Institute, waisdivide.unh.edu; Sridhar Anandakrishnan, Pennsylvania State University.

"We need to **carry on** and try to **get the message across further** in the U.S."

– Ross Powell, Northern Illinois University

LAPIS brings little-understood animal into focus

By Peter Rejcek
Sun staff

Scientists plying the waters west of the Antarctic Peninsula earlier this year got a good look at one of the most understudied, but potentially important, animals in the Southern Ocean: *Salpa thompsoni*, the dominant species of salp in the waters surrounding Antarctica.

Researchers from Woods Hole Oceanographic Institution (WHOI) rolled out a prototype of a new digital imaging system during a February and March science cruise aboard the *R/V Laurence M. Gould*. It took a dozen years to bring LAPIS, which stands for Large Area Plankton Imaging System, from the drawing board to deployment, but the wait was worthwhile, according to one of the scientists involved in its design.

"[It's] generating really good images of things that you just can't collect with nets, things that nets just disintegrate," explained Erich Horgan, WHOI research associate, who was aboard the *Gould* earlier this year for the salps study.

Salps are planktonic tuncates, transparent, barrel-shaped creatures that somewhat resemble jellyfish (or, for the science fiction-minded, otherworldly spaceships). Though gelatinous and generally only a few centimeters in length, salps are close cousins to vertebrates. They move through the water by drawing water in through one siphon and pushing it out through another. The water passes through a mucus membrane that filters all particles and food, such as phytoplankton.

Larry Madin, also from WHOI, and Patricia Kremer, of the University of Connecticut, were the co-principal investigators during two field seasons on the *Gould*, the first in 2004 (see *The Antarctic Sun* issue Dec. 5, 2004, at *antarcticsun.usap.gov*). Their purpose was to collect basic information about *S. thompsoni*, which despite being prevalent throughout the Southern Ocean, has not been well studied in the past, partly due to the difficulty in measuring abundances and collecting samples. Scientists know considerably more about krill, crustacean-like zooplankton that forms the foundation of the Southern Ocean food web, in part because they are easy to capture.

"Our goal was to do the very basic kinds of measurements," Madin said, such as determining population distribution and vertical migration patterns.

LAPIS will prove to be a valuable tool for scientists studying salp, krill or similarly sized plankton, or what Horgan calls "stuff you can eat with a fork." In fact, while towing LAPIS several hundred meters below the surface, researchers got high-resolution images of what's called krill shock molting – the krill "jumping" right out of their shells.

L. P. Madin / Special to *The Antarctic Sun*

Team members work with the LAPIS imaging system on the deck of the R/V Laurence M. Gould *in February 2006. The device was used to look at the jellyfish-like salps earlier this year.*

"Our krill colleagues … are very excited about [LAPIS]," Horgan added.

The basic components of LAPIS are a camera system, strobe lighting system, environmental and operational sensors and telemetry system. The pieces attach to a skeletal platform made primarily of welded aluminum pipes. The four strobes illuminate a 62-square-centimeter area that's 24 centimeters deep. The camera is capable of taking 30 frames per second of high-resolution digital images and can identify 99 targets per frame. That means scientists can spot individual members of a salp or krill aggregation.

"LAPIS is relatively stealthy," Horgan explained. "It kind of sneaks up on stuff. They don't necessarily know they're having their picture taken. So they're just going along feeding, behaving, swimming … and we can get consecutive images that we can piece together little movies to see how they're behaving."

The *Gould* made 28 tows with LAPIS, capturing an estimated 100,000 "good images," according to Horgan. In addition to spotting individuals in a massive swarm, LAPIS's imagery is good enough to identify the even smaller parasitic organisms living in the transparent body of salps.

"It's remarkable in terms of the quality of the data you get, the quantity of the data you get," Horgan said.

Here to save the world?

At first glance, salps don't seem very impressive. They're fragile. They don't offer much in the way of nutrition for animals higher up in the food chain. Plus, they just muck up nets used by researchers capturing krill to study.

But these innocuous critters have recently started generating headlines thanks to the role they play in transferring carbon from the surface ocean to deeper waters.

The oceans absorb excess carbon dioxide from the atmosphere. Phytoplankton (tiny marine plants that are part of the plankton that drift in the water column) living in the upper part of the water column take up the carbon dioxide during photosynthesis.

Salps are voracious eaters, little vacuums sucking up anything that passes through them 24 hours a day. The phytoplankton carbon they ingest comes out as fecal pellets, which Madin and another WHOI scientist, Richard Harbison, discovered sink as much as 1,000 meters a day. The pellets head to the ocean floor, where they are buried by accumulating sediment. It can take thousands of years before that carbon returns to the atmosphere.

Dense swarms of salps in the Mid-Atlantic Bight region, between Cape Hatteras and Georges Bank in the North

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Effort protects Lake Vida from contamination

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"The environment department has a contaminated sites tracking list. There are several sites on there, and each year we're knocking a few off."

Christensen is fresh from the experience of "knocking off" a site that has been a concern for several years – the No. 6 borehole from the Dry Valley Drilling Project (DVDP) of the early 1970s.

The DVDP – a joint effort by the United States, New Zealand and Japan – was the first deep drilling project on the Antarctic continent. Fifteen holes were drilled as part of the coordinated scientific effort to investigate subsurface geology of the McMurdo Sound and McMurdo Dry Valleys areas. Three of those boreholes were drilled in McMurdo. Most of the rest were in the Dry Valleys.

DVDP6, which Christensen's team sealed Nov. 1, was originally near Lake Vida in Victoria Valley, but the rising lake has recently covered the area. Pipes were installed to extend the hole above the lake level to protect it from diesel fuel in the borehole. It was one of eight holes that were left filled with diesel fuel during the project.

Why diesel fuel?

Drill bits must be lubricated while drilling through rock. Finding something that would not freeze was a challenge. The decision to use diesel fuel was made because it would not freeze at temperatures present in the area.

"On some of [the boreholes], they used a calcium chloride solution to drill and, on some of them, they used diesel," said Christensen. "In certain holes, they filled the boreholes with diesel to keep them open for scientific investigation in the future."

One reason the No. 6 site was given priority status for cleanup was that the level of Lake Vida has been rising and there was some concern about contamination getting into the lake itself.

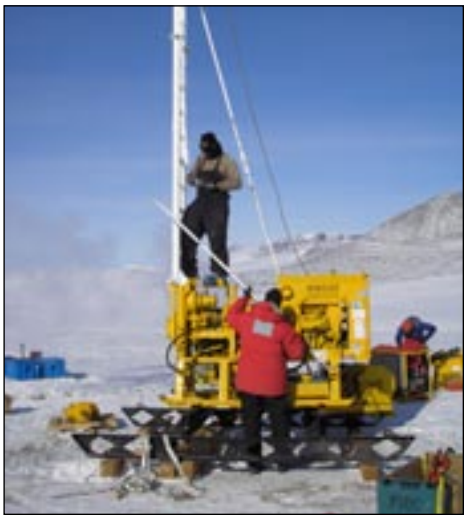
"The whole area is scientifically valuable," Christensen said, "but this specifically would have impacted a whole other realm of the valley."

Getting it done

The biggest challenge was getting a six-ton drilling rig to the remote site and setting it up. The first step involved fleet operation's Marble Point traverse team hauling the rig across the sea ice of McMurdo Sound. From there, helicopter pilot Chris Dean spent about five hours ferrying the rig sections to the site and assisting the crew with the rig setup.

Before the drillers arrived to set up the unit, Christensen and Dan Frerich prepared the area by digging a hole about two meters deep around a section of pipe that topped off the borehole to protect the rising Lake Vida from the diesel. The pipe had tilted and they had to replace it in order to get the rig on the hole.

Photos courtesy of Kaneen Christensen / Special to *The Antarctic Sun*



Above, Dan Frerich works to prepare the existing pipe so the drilling rig could be attached to it. Environmental engineers are steadily cleaning up potentially harmful former research sites, such as this borehole at Lake Vida.

At left, workers prepare the rig to help clean out the hole, which was left filled with diesel more than 30 years ago to keep it from freezing.

Once the drill was set up, they started bailing diesel from the hole, using a device designed to obtain water samples. It was hauled up by a winch on the drilling rig.

"At about 101 meters, we hit something funky but pushed the rod to 120 meters," Christensen said. "We weren't really sure what was sticking, so we pulled the 120 meters of rod and found a diesel-brine-ice slushy mix on the drill bit."

When they started running a different drill bit down the hole, they hit something solid at 94 meters depth, 26 meters short of where they last were.

She explained that there was a fracture zone at the 88-meter level and that after they bailed out the diesel and removed the drilling rods, fluids had entered the borehole from the fracture zone and froze the diesel slush into a solid ice blockage.

"Then we were, like, 'Great, we've got a solid plug in there; we're not going to get any more diesel coming above 94 [meters]. Let's seal it.'"

To put an additional cap on top of that plug, they filled the hole with fresh water to within 12 meters of the top . As it froze and expanded, the top rose to a height of about nine meters. From that point, they filled the hole using a grout of Portland cement to

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Salps doing their part to combat global warming

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Atlantic, are estimated to have transported as much as 4,000 tons of carbon a day to deep water.

"This is a naturally occurring process for removing carbon from the surface to the deep part of the ocean," Madin noted of the salp's ability to package carbon in fecal pellets. However, he cautioned, it would be rash to think salps could save the planet from global warming, despite their prodigious reproductive capabilities to produce hundreds of individuals in just a few days.

In fact, while the proliferation of salps could provide a relief valve for excess carbon dioxide in the atmosphere caused by the burning of fossil fuels, their growing numbers compete with krill. How that competition is playing out in the Southern Ocean, and how it affects the food web, remains murky at this time, Madin said.

"There is some evidence that those [salp] populations may be increasing in the last couple of decades," he said.

Scientists say additional cruises within the Southern Ocean, especially with such tools as LAPIS, will help them understand what long-term effects salps may have on such disparate issues as global warming and the fragile Antarctic food chain.

"Every cruise we find something, but there are always loose ends," Madin said.

NSF-funded research in this story: Larry Madin, Woods Hole Oceanographic Institution.

The center image of a collage of nine images of marine animals taken by LAPIS shows a solitary Salpa thompsoni. *Two aggregate chains of* S. thompsoni *can also be seen at the top right and top center.*

Courtesy of Erich Horgan / Special to *The Antarctic Sun*

Cleanup crews eyeing deep field sites

Courtesy of Kaneen Christensen / Special to *The Antarctic Sun*

A helicopter helps to break down the drill rig at Lake Vida.

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within one meter below the lake ice surface.

Filling in any of the DVDP holes does require consultation with other national parties that were part of the original project. One of those, New Zealand, assisted in the Lake Vida cleanup by providing helicopter hours.

Christensen said the focus of their environmental remediation field efforts is shifting toward deep field sites as nearby areas are being cleaned up. Many of those deep field sites are old fuel caches or field camps that need to be removed. Such a project is under way at Taylor Dome.

However, she also has her eyes on some things a little closer to home.

For one thing, as the annual snow melt starts occurring in McMurdo Station, the remediation team spends many hours cleaning debris and refuse from local sites. But there are also a couple of other boreholes in town that the U.S. Antarctic Program will be cleaning and closing.

All USAP activities are subject to the environmental assessment process, under the Protocol on Environmental Protection to the Antarctic Treaty.

Profile The queen of the chop

By Steven Profaizer
Sun staff

Jessica Gonya is one of the few people who can say she is as comfortable chopping vegetables in a kitchen as she is logs in a timber sports competition.

This is her third season as the cook at Black Island, where she prepares family-style meals at one of McMurdo Station's small satellite camps. This is also her 10th year participating in timber sports, which pit participants against each other – chopping, sawing, ax throwing and log rolling their way to victory.

Gonya first got involved with the sports after attending a demonstration by the timber sports team at one of the colleges she attended. She said she was pulled in by the underhand chop event, where competitors stand on top of a log and swing the ax down between their legs to chop it.

"I was just like, 'That is so cool. I've got to try that,'" said Gonya, who has now completed between 100 to 150 competitions in the niche sports.

"Most people only know about timber sports when they come home drunk and turn on ESPN late at night," she said.

Gonya is used to people being surprised, and a little wary, of her pastime.

"Especially when they want to know what events you do, and you describe one like underhand. They're like, 'You do what? You stand on a log and chop in between your legs? Don't you cut your toes off?'"

Gonya said she's actually never been scared of losing a digit during a competition, as many participants wear butcher's mesh socks to protect their precious appendages.

But her friend "Stumpy," who she said has "never chopped his toe off totally but has come close a couple times," serves as a reminder that things can go wrong even for well-trained professionals.

Axes can take a good chunk out of professionals' bank accounts as well as their toes. Competition-quality axes cost around $300.

Gonya owns six, including Fred, Nelly, Joe and Robert.

"It is normal to name axes within the sport. You're spending a lot of money on the stuff and a lot of time with it – things just get named," she said. "Fred is my favorite. He has a nice edge on him. And for white pine, he's pretty cool. When he chops, it just comes out nice."

Similar to a golfer's bag of clubs, the weight and grind of different axes are fine-tuned for different jobs. In her collection are a practice ax and five specialized axes for different species of wood.

Courtesy of Jessica Gonya / Special to *The Antarctic Sun*

Jessica Gonya bears down on a bow saw during a competition at the Woodmen's Field Days in Boonville, N.Y. She currently works as cook at Black Island, near McMurdo Station.

"In New York, you chop a lot of white pine, but the pine from there is different than the pine in the Midwest, so you have to have a couple different axes. In the south, where I chop, a lot of it is gum, which needs a total different ax, or aspen, which is a different ax again."

One of the greatest rewards of timber sports for Gonya has been getting to know the people involved.

"They're the kind of people that if you were stuck on the side of the road and they drove by and saw you, they'd pull right over. They're just a good group."

They're also a small group. Gonya estimated there are about 400 regular competitors worldwide, and only about 10 percent of those are females. With high passion and low numbers in the timber sports community, much of the group stays in close communication.

"If someone had an amazing chop, you've heard about it before the weekend is over," she said.

Gonya works in the off-season as part of the Augusta Hotshots, a team of elite wildland firefighters near her home of Augusta Springs in mountainous western Virginia. She hails from upstate New York, which is where she learned of timber sports and earned her bachelor's degree in forestry.

After graduating, she worked for two years in a marketing position focused on forestry. This allowed her to work with the outdoors daily, but only as an office-dwelling observer, and her desk was not the kind of wood that she wanted surrounding her all day. So, she made her escape and became a wildland firefighter.

"Since I've been back working in the woods, I realized how much I enjoy being outside," she said.

Gonya, 30, said she is still early in her timber sports career. She said most women do not reach their peak performance in the sport until their early 40s.

"I know a 56-year-old woman who does it, and she's amazing," she said.

Gonya said that while strength is important, timber sports focus on technique, giving the advantage to the more seasoned competitors.

She compared the refining of the sports' skills to the tweaking and tuning of a race car after each event.

"It's kind of the same thing when you're chopping. What gives you the harder hit? What gives the faster hit? What gives you deeper penetration of the ax into the wood?"

She said that mindset of constant refinement has spilled over into other areas of her life.

"I'm still learning. I've been doing this for 10 years, but every day, every competition, every new piece of wood is different. It's a challenge," Gonya said. "Each time I think about what I did better than before and what I need to do better on next time. I found I think about a lot of things in my life like that since I've been doing timber sports."