

The Antarctic Sun

"News about the USAP, the Ice, and the People"



<http://antarcticsun.usap.gov>

March 25, 2011

Christchurch earthquake Witnesses recall first days of crisis as search finds all USAP personnel are OK

By Peter Rejcek
Antarctic Sun Editor

Most people have seen the pictures of the crumpled Christchurch Cathedral or watched the video of a woman plucked from the roof of a collapsed building to safety by a fire crew.

But was the destruction wrought by the 6.3-magnitude earthquake on Feb. 22 as bad as it looked in media reports?

It was worse, said Mel Moore.

Moore and his wife Sally Moore were among the hundreds of U.S. Antarctic Program (USAP) participants who were just leaving the Ice as the summer field season was winding down when the quake hit the city center.

The Moores were in a small, cramped antique store in Christchurch's central business district (CBD) when the ground started shaking and the lights went out. Mel Moore swatted a plate away that he saw falling toward his wife, as glass and ceramics crashed to the floor.

After the earth stopped moving, the Moores and the shop owner, bleeding from a head wound, attempted to leave the store.

"The way out was blocked by all the bookcases that had fallen over and the broken debris. The owner said not to worry about breaking anything, just get us out of the shop. As Sally says, I went into 'Mel-dozer' mode and quickly cleared a trail," said Mel Moore, a man who would size up well on an NFL offensive line.

Once outside, the scene was chaotic. Sirens and alarms echoed around the



Photo Credit: Wikipedia Commons

The Christchurch Cathedral in the center of the city after the Feb. 22 earthquake. Many USAP personnel were in the central business district when the 6.3-magnitude earthquake hit.

city; the air was filled with dust. Amid the confusion, the Moores eventually headed to the safety of the open space at Victoria Square.

USAP offices go into action

Less than two hours after the quake struck, the first situation report—a sitrep, in military slang, which still dominates the U.S. Antarctic Program from its days when the U.S. Navy ran logistics on the Ice—came out of the program's offices in Christchurch. All of the local New Zealand staff who works for the USAP at a facility near the city's international airport had already been accounted for and were safe.

Kerry Chuck, manager of the New Zealand Operations, reported that nearly 600 people in the USAP, including military personnel associated mainly with flight operations, were believed to be in the area.

The e-mail went out to officials at the National Science Foundation (NSF) and in the Denver area to company leaders at Raytheon Polar Services (RPSC), the prime contractor to the NSF.

RPSC immediately established a "command center" in its Denver office, and the search began for about 600 people who could be anywhere



Photo Credit: Chad Naughton

The parked car that may have helped save Chad Naughton's life as he ran underneath an avalanche of bricks.

in the city or South Island. Several Raytheon employees would spend the night at the office to begin organizing a plan to evacuate everyone from the area in coordination with the staff in Christchurch.

“As I was about to hit the send button, we have had another severe shock,” Chuck’s message concluded.

Caught in an avalanche

The aftershocks motivated Chad Naughton to get as far away as possible from the city streets and the surrounding buildings, as he stood stunned, bruised and bleeding after being pulled to safety from under a pile of bricks.

Only moments before, he had been in a map shop on the corner of Gloucester and Manchester streets, talking to an employee about possible hiking spots.

Then the sound started, as Naughton remembers it. “It was incredible, a low grumbling sound that immediately turned into a very loud, very real, frightening banging and crashing that kept getting louder and louder. The ground was moving in all directions.”

He made the decision to sprint out the front entrance as ceiling tiles and lights crashed around him, running toward a white car parked outside, as the bricks on the building’s façade came down in an avalanche.

“That classy lil’ number may have just saved my life,” said Naughton, who works as a science planner for RPSC. “It created a triangle of space that saved me from the full impact of

the falling debris. If I was three feet to the right, or that car was not parked there, I fear I may not have been so lucky. I ended up buried under some bricks with my head in the street.”

The next thing he heard was a voice in a German-sounding accent asking him if he was OK. The man helped Naughton to the middle of the street. Naughton was bleeding from the back of his head, and his knee was throbbing. But he was alive.

And then the first aftershock came.

“Imagine standing on something like the ground, which we normally trust, and now it is doing everything it can to knock you down,” Naughton said. “This one was over as soon as it started — thankfully. I looked around, and noticed a tall building on every

corner and decided it was time to walk to a safer place.”

He started following a herd of people toward Latimer Square.

Storms pummel McMurdo Station

Meanwhile, back at McMurdo Station, a severe storm was moving into the region. Only about two weeks remained of the summer field season, and operations were shifting into winter mode. More than 200 people were scheduled to fly north to Christchurch, leaving about 150 to run the station over the winter months.

The sea ice in McMurdo Sound was finally breaking up to an extent not seen in more than a decade. All it needed was a good push with a little bit of wind.

It got it.

The major storm howled through the region for about three days, clearing the Sound of ice and even chipping away at the permanent McMurdo Ice Shelf where a snow road and fuel line run out to Pegasus airfield about 14 miles away from Ross Island. Additional flights north were delayed.

Station personnel would be busy for several days digging out of the storm and securing the fuel tanks where the cracking of the ice shelf was getting uncomfortably close.

And, of course, they were worried about friends in Christchurch, some of whom had flown out just a couple of days before the earthquake.

Joining the rescue effort

David Berry was one of those people recently arrived in Christchurch. He had walked downtown on the morning



Photo Credit: Ryan Wallace

The ice edge in early March near Scott Base. Mount Erebus is in the background at left.

of Feb. 22 from the Windsor Hotel to purchase a few last-minute items for a camping trip he had planned around the South Island.

He was about 200 feet from the cathedral, waiting for his curry lunch to arrive at an Indian restaurant on the town square, when “the place started pitching, and the staff yelled earthquake! We all bolted out the door and just then the [cathedral] spire began to collapse.”

Berry’s instincts took over, as someone who has served on Search and Rescue teams in New Mexico, not to mention 15 years of experience as a wilderness EMT.

“When things get strange, I just go into SAR/EMS cruise control. Nothing fancy about all this ... just trained and done it in the past,” said Berry, who works as an aircraft ground equipment mechanic at the McMurdo Station airfield.

He and others in the vicinity who had quickly shaken off the initial shock set up a triage area on the cathedral lawn and started looking for injured. Berry said the makeshift rescue team was able to pull six injured people out of the church before the next aftershock, which made it too dangerous to re-enter.

The volunteer team also included a couple of Israeli military medics and a group of Australian doctors who were in town for a urology conference.

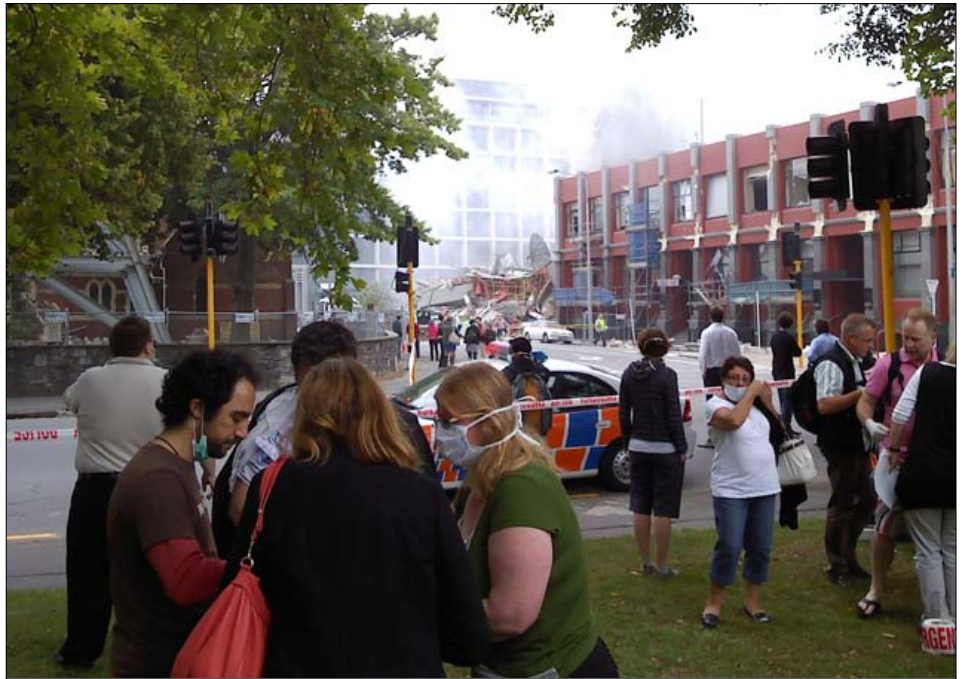


Photo Credit: Chad Naughton

People gather in Latimer Square for safety away from the taller buildings around the central business district of Christchurch.

They were eventually recruited to the New Zealand Press building behind the cathedral where the top floor had collapsed. After about four or five hours, they were able to rescue eight people with the help of a crane and hydraulic jacks.

“All in all, I probably worked on 50 people,” Berry said. “We ran out of bandages and splinting material, so a local cop and an intern raided one of the tourist shops and returned with boxes of tea towels and ‘I love NZ’ pillows.

We used the pillows for soft splints on arms and legs, and made splints out of cardboard and cafe signs — all tied up with tea towels.”

USAP ‘refugees’ take shelter near airport

In Victoria Square, the Moores reunited with other Ice people. They learned that their hotel, the Crowne Plaza, had been damaged, and no one was allowed inside the building. All they had with them were the clothes on their backs.

The group made its way to Hagley Park, which had been designated as a refugee center. They found more people from the Ice there, and the group, which had grown to 18, started walking toward the airport and the USAP offices and facility, which includes a warehouse called the clothing distribution center (CDC).

They had walked about half of the six miles from the city center to the airport when a shuttle from the CDC picked them up and drove them the rest of the way.

That part of the city was in good shape. It had electricity and water, unlike about 80 percent of the town that first day. Telephones and the Internet worked.

By the end of Tuesday, the Moores and the others they had met in Victoria Square would be joined by about 100 USAP people at the CDC, which would



Photo Credit: Chad Naughton

Earthquake damage on Gloucester Street.



Photo Credit: Peter Rejcek

The botanic gardens across from the Arts Centre of Christchurch before the earthquakes that destroyed many of the city's historical structures in September 2010 and February 2011.

become a temporary shelter through the end of the week. That night everyone was fed and given sleeping bags.

Christchurch staff work selflessly to help others

At the same time, the RPSC Christchurch office personnel were also assisting New Zealand police and the U.S. embassy, which was trying to evacuate a delegation of U.S. and New Zealand government officials who had been attending a forum in Christchurch.

Keep in mind that some of the 24 people of the RPSC New Zealand staff had suffered damage from the 7.1-magnitude earthquake that shook Christchurch on Sept. 4, 2010, either to their houses or possessions. Two people had lost their homes and three had sustained serious damage. On Feb. 22, more staff was affected, with two more houses seriously damaged.

“When the earthquake occurred, the first concern of the Christchurch staff was the welfare of the USAP participants,” said Lindsay Powers, who was driving near the airport when the quake hit. Originally, she thought the car had lost a tire before learning about the trembler.

“Immediately after the staff confirmed the safety of their families, they were tirelessly committed to the support of the USAP program,” said Powers, RPSC Science Planning manager, who worked and slept at the

Christchurch offices until she caught a flight home to Denver a few days later. “I know we are all proud to call these people our friends and colleagues.”

Despite the personal and professional challenges, the staff would track down nearly 200 USAP people the end of the day and confirm they were safe.

Quake experience teaches lesson on preparedness

Naughton was among that number when he called into the CDC that same night.

It had taken him about an hour to walk to a medical center off Bealey Avenue, where one of the out-of-town urologists sewed up his arm while a nurse cleaned all his other scrapes and cuts.

“She glued that laceration on my head together, and I couldn’t help [but] laugh, thinking how lucky I was,” Naughton said. Some Kiwi friends found him, and together, they made their way far from the city, where he would stay until his flight out of Christchurch about a week later.

The experience taught Naughton that he has little desire to live in an earthquake-prone city, to say the least.

“But if you do, make sure you know where you would go if the ground we know and trust begins to grumble and shake,” he advised, reflecting on the experience to friends. “I would also recommend carrying your passport

with you, because I had to get an emergency one. You forget to do this in Christchurch because it is a very safe, quiet, quaint country, so I just left mine in the hotel per the usual.”

Waiting for a ride to Auckland

The Moores had also left their passports behind, along with most of their possessions, at the Crowne Plaza. By Wednesday, a curfew had been imposed in the CBD, and only rescue workers were allowed into the city center.

But the Christchurch airport had suffered only superficial damage and reopened on Feb. 23. The Moores had secured a hotel room nearby and had a scheduled flight out on Friday. They shared their room with a couple of other Ice people for the next couple of days while waiting for their flight north.

“During Wednesday and Thursday, our big adventure was going to CDC to get any news,” said Mel Moore, McMurdo Supply Operations supervisor. “Sally would use our five minutes of allocated computer time to update her mom, who would in turn update my mom. Then we would go to the airport ... and get some supplies. We were just so excited when we were able to purchase a change of clothes so we could do laundry.”

The U.S. embassy was securing temporary passports for the stranded Americans. The New Zealand staff at the CDC had arranged for the Royal New Zealand Air Force to start flying USAP participants in the region north to Auckland, the largest city in the North Island.

Flight schedules and social media

Lynn Dormand and her team back at RPSC reviewed nearly a thousand different travel itineraries as they scrambled to reroute people in New Zealand, as well as those who would be coming off the Ice in the next week or so. They had re-ticketed more than 500 people at the time of this report.

“The airlines were significantly important. They provided us blocks of seats, with differing routings, based on a humanitarian request I placed, which was answered by the VP of Qantas,” said Dormand, manager of RPSC’s Deployment Specialist Group.

By the end of the day, about 60

percent of USAP personnel had been found thanks to the long hours pulled by many in Denver and Christchurch.

A spontaneous online community had also popped up on the social networking site Facebook, growing to about 500 members, as people provided tips and details on those still missing.

Meghan Brown created the page “Ice People Earthquake Check-In” only a few hours after the earthquake hit from McMurdo. She said Facebook would be a natural place to check on peoples’ status.

“I figured there is a much larger network of USAP participants that I am not connected to on Facebook, but through social networking we could quickly and easily connect to one another,” said Brown, an administrative coordinator for science cargo for her third summer season in the program. “My first concern was to take account of people and ensure their safety, and I felt that social networking-media was the best resource for this.”

Volunteer ‘pretty happy with all that we did’

Berry had gotten an early start on Wednesday.

He spent Tuesday night at Hagley Park. He caught a few hours sleep – sharing a blanket with a physician from McMurdo – and then went back into the city to help with the rescue efforts.

He discovered that the Windsor was badly damaged and too dangerous to enter, leaving him only the clothes he was wearing and his passport. Amazingly, his rental car survived without a scratch.

After assessing his own situation, he joined an Urban Search and Rescue team that went into a nearby B&B to recover the owner’s clothes and some family pictures. During the day, he ran into a friend from the Ice who was staying at a hotel near the airport. Berry took the opportunity to take a shower and clean up, thankfully getting some clean clothes from his buddy.

He spent Wednesday night on the floor of the CDC, learning that flights would be available to Auckland by tomorrow. He was home in Silver City, N.M., by the end of the month.

Berry emphasized that others from McMurdo also helped with rescue efforts those first critical hours.



Photo Credit: RPSC NZ office

St. John’s Ambulance occupies the rear of the airport passenger terminal at the RPSC Christchurch offices.

“I’m pretty happy with all that we did, and I know that we would do it again anytime. We love the Kiwis and Christchurch,” Berry said. “I love the fact that so many folks on the Ice have a huge knowledge and experience base, step right up, and take care of business when things get strange.”

Everyone found safe

The chaos of the first 48 hours ebbed. About 90 percent of the USAP people believed to be in the area had been found within those first 72 hours. Everyone would eventually be found alive by the end of the week, the last two actually out of the country in Tonga.

The furious storm in McMurdo dissipated, though apparently not before claiming the lives of three adventurers aboard a yacht who were part of an expedition to reach the South Pole. Two men had gone ashore before the vessel disappeared in an attempt to ride quad bikes to the Pole as part of the 100-year anniversary of the first adventurers to reach the bottom of the world.

The two Norwegians eventually abandoned the expedition. They joined about 200 people from McMurdo on a pair of flights aboard a C-17 on Feb. 27 and 28 (local time) to Christchurch. The final flight of the summer season left Pegasus airfield on March 5 aboard an Australian Airbus 319.

Christchurch forever changed

The crew wintering over in McMurdo will have a busy season ahead, working to secure the road on the ice shelf and

repair the ice pier damaged during the storm.

Of course, the work pales in comparison to the rebuilding job ahead in Christchurch. Some online news reports said as much as a third of the central city will need to be torn down and rebuilt, costing billions of dollars on top of the September 2010 earthquake that also caused widespread damage — but without loss of life.

The RPSC New Zealand staff will attempt to retrieve the luggage and personal possessions many in the program were forced to leave behind over the coming weeks. About 150 people have contacted the Christchurch office with lists of what they had in their hotel rooms when the quake struck.

The Christchurch offices will be unusually full over the off-season, as the NSF has agreed to allow some New Zealand government departments to relocate temporarily to the facility after their own premises were destroyed. About 30 staff from the Department of Conservation will move into the administration office, St. John’s Ambulance will occupy the Antarctic Passenger Terminal, and the NZ Police Family Violence Unit will occupy the travel office.

“I cannot say enough about the Raytheon staff [in Christchurch],” said Mel Moore, as he summed up his story. “The best way I can put it is that the Christchurch we knew is gone, and we have no desire to repeat the experience.”

Extreme environment: Scientists drill into frozen Lake Vida to explore its 'weird' features

By Peter Rejcek
Antarctic Sun Editor

Lake Vida isn't a particularly accommodating place to live.

Consider that the Antarctic lake would hardly fall under the definition of "lake" for most people. It certainly wouldn't be found on anyone's top ten list of favorite fishing holes. In fact, neither fish nor much else could survive in the hypersaline lake, which appears to be frozen from the surface to nearly the bottom more than 20 meters down.

Oxygen is completely absent from Lake Vida, which is up to seven times saltier than seawater. Its chemistry is just weird, with the highest nitrous oxide levels of any natural water body on Earth. A briny liquid that courses through pockets and channels within this anaerobic environment exists at minus 13.5 degrees centigrade. Remember that the ocean never gets colder than a couple of degrees below zero.

"It's so cold that we know very few liquid ecosystems on the planet where the constant temperature is that far below zero," said Alison Murray, a molecular microbial ecologist at the Desert Research Institute in Reno, Nev., who studies how microorganisms interact with their environment.

"We don't know much about cellular processes — what it takes to make a living — at that temperature," added Murray, a principal investigator on a collaborative project to figure out how life has adapted for survival in Lake Vida.

Other members of the team, led by Peter Doran, a professor at the University of Illinois at Chicago, are interested in learning more about the history of the lake. For example, analyses of sediments from the lake bottom could provide clues as to what processes occur in bodies of water as the Earth moves into colder periods.

"The main goal is to get into that brine pocket and the sediment beneath it to both document and define the ecosystem that's there today, and the history of that ecosystem," Doran said



Photo Credit: Ema Kuhn

Members of the Lake Vida expedition team — Peter Doran, Chris Fritsen and Jay Kyne — use a sidewinder drill during the 2010-11 season to drill an ice core from the frozen lake. They did not find a liquid layer at the bottom of the lake that they believed existed based on radar data, adding a new mystery to one of the most enigmatic features in the McMurdo Dry Valleys.

previously.

That's exactly what Murray, Doran and their team attempted to do this past season: Probe deep into the lake to learn more about its biology, chemistry and history. And, as one might expect when exploring such an alien environment, they turned up the unexpected.

The first break

The 2010-11 expedition is the third visit to Lake Vida in about 15 years by U.S. scientists interested in its unique characteristics.

In October 1996, researchers extracted two ice cores from Lake Vida with an electromechanical drill, spending about two weeks at temperatures below 35 degrees Celsius to drill through 16 meters of ice.

A paper six years later in the journal *Proceedings of the National Academy of Sciences*, with Doran as the lead author, announced that Vida was not completely frozen and lifeless as previously assumed. Ground-penetrating radar, ice core analyses, and

long-term temperature data, showed that Vida had a thick, light-blocking ice cover, a vast amount of ancient organic material and sediment, and a cold, super-salty, liquid layer below the ice.

Carbon dating placed the age of the microbes recovered and revived from the ice cores at some 2,800 years old.

Going deeper

Doran and colleagues returned to Lake Vida in 2005 with the intent of drilling through the ice cover into the liquid brew underneath. That's when Murray got involved in the project, joined by DRI colleague Chris Fritsen, who was also on the 1996 team with Doran, John Priscu from Montana State University, and others.

The second attempt not only had the support of the National Science Foundation, which manages the U.S. Antarctic Program, but funding from the NASA Astrobiology Science and Technology for Exploring Planets (ASTEP) Program to test new drilling technology.



Photo Credits: Hilary Dugan (left) and Bernd Wagner

Left, Lake Vida in the McMurdo Dry Valleys. Right, a close look at the surface of Lake Vida with sediments on top.

The conditions at Lake Vida could mimic those found on Mars or Jupiter’s moon Europa, destinations where the space agency hopes one day to search for life. A lightweight, functional drill might be needed aboard a future mission to probe into a similarly ice-covered environment.

Meanwhile, a second drill operated by a crew from the University of Wisconsin-Madison supported the science mission of reaching the liquid layer.

Keeping it clean

“One of the big things we developed for that project was to develop clean access procedures,” Murray said, explaining that the scientists wanted to keep the environment that was believed to exist about 20 meters under the ice as pristine as possible. Potentially, it hadn’t been in contact with the atmosphere for thousands of years.

Strong winds in Victoria Valley, the northernmost of the McMurdo Dry Valleys where Lake Vida sits, blow across sand dunes on one side of the 5-kilometer-long lake. The team didn’t want the sediments to end up in their hole.

So they set up stringent procedures to keep the drill site and equipment clean, working under a tent constructed on the lake’s surface. Everything that went down the hole was sterilized like a surgical tool. An ultraviolet light system under the floor of the tent gave the instruments a final dose of UV radiation for good measure.

“The cleaning part of this is quite a process,” Murray said.

The team even developed a way to clean the drill hole itself. After initially

drilling a hole, they would widen it, and then clean the hole of all the water through a filtration process. They then would let the water in the hole refreeze, drilling through again into a clean ice “pipe” to sample the brine below the ice.

Running out of time

As the drill started to chew deep into the ice cover, a strange thing happened. Liquid brine began to fill up in the hole, well above where the GPR survey had identified the liquid water layer.

Brine channels that run through the lake started pouring into the borehole. The team pumped the brine out of the hole to analyze later and continued to bore down.

Unfortunately, time worked against them. A late start meant the researchers found themselves in the middle of the lake as the summer melt season began. The meltwater from nearby glaciers doesn’t flow into the frozen lake but pools on top.

“We were anticipating that we were going to get flooded out within a week, so we called it and closed the camp,” Murray said. The lake surface flooded about three days later.

Characterizing the brine

The researchers had to be satisfied with characterizing the brine, which was “quite unusual,” according to Murray.

The unusual chemistry somewhat resembles that found in the equally bizarre feature known as Blood Falls, where a subglacial pool of water under the Taylor Glacier in the Taylor Valley percolates to the surface of Lake Bonney. The iron oxide-enriched saltwater stains part of the face of the

glacier red, as well as the ice-covered surface of the lake nearby.

And while Lake Vida isn’t the saltiest body of water in the Dry Valleys — that honor goes to Don Juan Pond, which also has high levels of the laughing gas called nitrous oxide — the salts are sodium chloride, probably residuals of marine-derived aerosols.

The brine also contained high levels of iron and manganese, probably derived from the nearby rocks. Bacteria cell counts were also surprisingly high, particularly of a small cell type that Murray said the team didn’t “know anything about.”

A weird day

Those enticing results brought them back in 2010-11 on a NSF-Supported project to take another shot at the liquid layer below the ice, intrigued by the clues found in the brine from the upper ice layers. “We’re really delving into the things that we found interesting last time,” Murray said.

Drillers with the Ice Drilling Design and Operations group from the University of Wisconsin-Madison again led the effort to reach the liquid layer and lake sediments below.

By mid-November, the drill breached the 20-meter-mark. Then 21 meters, 22 meters ... Layers of ice mixed with layers of frozen sediments, which made the drilling difficult. Driller Jay Kyne, wearing a white Tyvek suit to avoid contaminating the equipment, kept stopping to sharpen the drill blades, eventually calling back to McMurdo Station for another set of cutters.

Twenty-three meters, 24 meters ... Still no water even at 27 meters. The drill never dropped down as it should

have if the drillers had penetrated a substantial water layer. “That was really quite a surprise,” Murray said of the lack of a brine pocket. “It was a weird day.”

Filtering away

A few weeks later, back at the Albert P. Crary Science and Engineering Center in McMurdo, team members spend long hours in the labs filtering brine water collected this season for various experiments that could reveal how the microbes in the lake produce energy in the absence of oxygen and light.

It could be that the organisms are chemotrophs, using the chemistry of their environment to obtain energy, explained Brian Glazer, a professor at the University of Hawaii who is one of several collaborators on the Lake Vida project.

“It’s better living through chemistry,” Glazer quipped. “They’re making sugars from the chemistry available to them.”

Some of the experiments take hours to complete, partly because of the difficulty of working with the brine. It has to be kept in an anoxic environment; otherwise, it forms particulates that clog filters used in different experiments. One method involves keeping a steady stream of nitrogen over the filter. A less appealing process involves working in an oxygen-free glove bag, a plastic bubble with built-in gloves.



Photo Credit: Peter Rejcek

Scientist Alison Murray from the Desert Research Institute performs an experiment in McMurdo Station’s Crary lab to learn more about the life hidden in the salty brine of Lake Vida.

“Even if we do manage to keep it anaerobic, there’s a large amount of dissolved organic matter in the brine, and it’s very sticky, and it also clogs the filters very rapidly,” Glazer said.

Some of the work takes place in a freezer with a constant temperature of minus 10 Celsius to keep the brine as close as possible to its original environmental conditions.

“It gives us as clear a picture as possible of what the brine really is” working in the freezer room, Glazer said.

Time will tell

Meanwhile, Hilary Dugan, wearing a big red parka, plays the role of team photographer in a different freezer room, with the temperature at a finger-numbing minus 20 degrees. A slushy, dirty-looking ice core sits on a light table. Dugan photographs each section of ice before it’s packed for shipment to the United States.

A PhD student with Doran, Dugan is interested in the physics and history of the lake system. The absence of a liquid layer could mean many different things. Perhaps the lake has frozen solid to the bedrock since the GPR survey 15 years ago. Maybe the spot where the team drilled was on a high point of the lake.

“We sort of have to readjust how [we think] the lake formed, which is neat because there’s no other lake in the world that has this much ice frozen right to the bottom with that amount of life, that amount of carbon in it,” Dugan said.

Dugan, with the help of the McMurdo Station Field Safety Training Program team, conducted a new GPR survey of the lake, hoping an updated view of the layers below the ice cover will tell the scientists something about that missing water pocket.

Speaking later via e-mail from the States, Doran said the team will meet soon to discuss the results of the latest radar survey to determine what the collaborators believe might be



Photo Credit: Peter Rejcek

Scientist Hilary Dugan photographs a section of ice core from Lake Vida in a freezer room at minus 20 degrees Celsius. The ice cores, which also contain sediments, will be analyzed to learn more about the history and chemistry of the lake over time.



Photo Credit: Hilary Dugan

A helicopter flies over the tents used by the research team on Lake Vida.

happening.

“I think the leading candidate right now is that the lake is a sequence of dunes migrating over top of the lake, then more lake ice, then more dune migration, etc.,” he said. Additionally, there may be some muddy floodwaters mixed in the lake as well.

Laboratory work back in the States on the ice-sediment sequences in the core might provide some clues as to what happened in the past despite the mixed layering, according to Doran.

“The problem with ice in this system is it comes and goes, and so we may not have a continuous sequence,” he said. “Sediments can tell you about the history and chemistry of the lake over time. So we’ll get our record, but it will be tricky and probably the timeline is going to be hard to nail down with as much accuracy.”

So close, so different

Each body of water in the Dry Valleys seems to possess its own unique history, making it difficult to compare lakes within the same valley, let alone the whole region. It seems surprising, given the whole region is only 4,800 square kilometers.

Doran explained that Lake Vida is unique because Victoria Valley is sheltered from winter katabatic winds that normally warm the valleys. That means it’s colder in Victoria Valley than farther south, allowing the lake’s ice cover to grow. The summer melt that later pools on top of the lake just adds to the thickness.

In fact, the lake ice cover has grown about a meter in the last decade, according to Dugan. “That’s a lot of hydrological input,” she said.

The Dry Valleys have always been a favorite analogue for scientists with a yearning to understand life beyond Earth. Vida may be the most alien of all.

“You can imagine you’re walking on Mars,” Dugan said, returning to the theme of planetary research that the Lake Vida project represents. “We might have a system that’s closer to life on other planets than other places in the Dry Valleys.”

Links to the past and future

Lake Vida is also an interesting model for those interested in studying

ancient climate right here, when the planet was periodically in a deep freeze called Snowball Earth. Some scientists believe much of the planet, all the way to the equator in some models, was covered by ice hundreds of millions of years ago.

Murray said that it’s possible that Snowball Earth lakes could have resembled Lake Vida, with brine pockets that might have served as refuges for life on a planet turned extremely inhospitable.

“That’s a good link to past history on Earth,” she said.

A more tangible connection that Murray hopes to make as she gets into the genetic level of the study is how the Lake Vida microbial community compares to relatives of bacteria from other places on the planet. What adaptations do the lake extremophiles show compared to their cousins in less stressed environments?

“One of the biggest legacies I think we can get from this system is having a culture collection of diverse organisms that are from there and capable of life at minus 13.5. It could prove to be really useful models for studying cryobiology,” she said. “I’m quite interested in the diversity of those organisms.”

NSF-funded research in this story: Peter Doran and Fabien Kenig, University of Illinois at Chicago, Award No. 0739698; and Alison Murray, Chris Fritsen and Giles Marion, Award No. 0739681.



Photo Credit: Alison Murray

Graduate student Emanuele Kuhn tends to the in-line filtration system used for ice melt water particle removal under the drill tent on Lake Vida.

Robinson trades computer for gloves to compete in the ring as *nak muay farang*

By Peter Rejcek
Antarctic Sun Editor

Martin Robinson is not unlike many support personnel who work for the U.S. Antarctic Program.

He has an office job in Antarctica with the McMurdo Station IT Help Desk, troubleshooting problems for PC users. On his way to lunch, the walk affords him a view of the gleaming glaciers that drape over the Royal Society Range across McMurdo Sound.

And like many of his co-workers, he takes advantage of the seasonal nature of the job and travels around the world between contracts.

But he is likely the only one in the USAP who spends his off-season months as a professional boxer in Thailand.

Few would guess that Robinson is a trained *nak muay farang*, a foreign boxer, who practices Muay Thai, a style of kickboxing as popular in Thailand as baseball is in the United States.

If anything, Robinson gives the impression of a Zen master, with two long braids dropping from his graying beard on either side of his chin and a third, shorter wisp of facial hair hanging from below his bottom lip. A tranquil demeanor adds to the Eastern



Photo Courtesy: Martin Robinson

Martin Robinson raises his arms in victory after a bout.

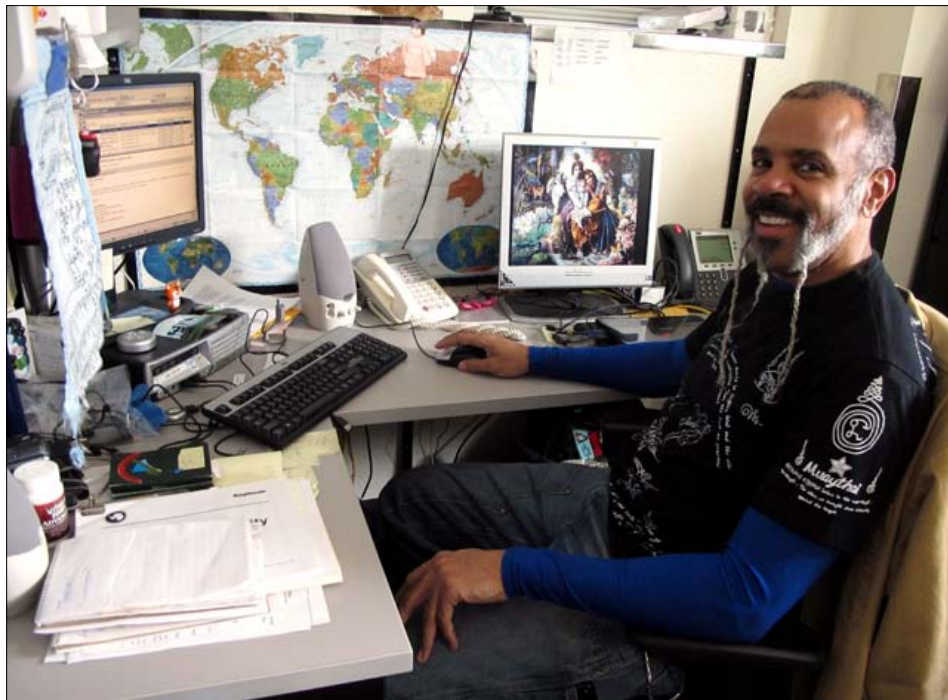


Photo Credit: Peter Rejcek

Martin Robinson works the computer help desk at McMurdo Station. Every year at the end of the summer field season in February, Robinson heads to Thailand, where he trains and fights as a *nak muay farang*, a foreign boxer, in the national sport of Muay Thai.

mystique.

“I don’t want people to think I’m the kind of person who would go and beat people up,” says Robinson, who has an easy and gentle laugh. “It’s totally out of character for me.

“The real reason I wanted to do it was because I had never really been in a fight. It was like *Fight Club*,” he adds, again chuckling at the idea of himself in a ring in Thailand. “The guy [in the movie] says how much do you really know about yourself if you haven’t been in a fight. It’s true.”

Robinson first worked at McMurdo Station during the 2005-06 field season. He immediately became enamored with the Antarctic lifestyle and couldn’t imagine returning to the hour-long commute and smog-filled city when he left his job with the American Red Cross in Washington, D.C.

He’s returned to the Ice every season since. In 2007, he wintered over in McMurdo, leaving for a couple of months in August and September before going back for another summer hitch.

Two months didn’t seem like enough time to go back to the States to visit family. Friends on the Ice invited him along for a trip to Thailand. Not someone who partakes in the beach party atmosphere offered by the popular Southeast Asia country, Robinson opted for a different vacation.

He found a Muay Thai school in famous beach town of Phuket that offered a sort of fantasy camp for tourists hoping to learn a bit about Thailand’s national sport. Robinson says he never intended to fight anybody.

But after a couple of weeks of training, as his body adjusted to the exercise, Robinson says he wanted more from his experience. He wanted to take it to the next level.

“I tell the guy that I want to fight. He tells me I’m too old,” says Robinson, now 43 years old.

But the trainer, a former Muay Thai world champion, agreed to school Robinson as a true *nak muay*. The technique is often called the Science of Eight Limbs, because it employs hands, feet, elbows and knees, unlike

other forms of martial arts.

“The next day they trained me so hard it was like the first day again,” recalls Robinson, who stands well over six feet tall with the physique of a heavyweight fighter.

He had one fight that year — and lost. “I’ve never even been in a bar fight, a school fight, or anything. The first time I had ever punched anybody was in Thailand in that Muay Thai fight. That’s probably why I lost. I had unrealistic expectations of what it would take to win,” he says.

Undeterred, Robinson has returned each year since to Phuket after a summer at McMurdo, where he usually trains for the annual marathon that takes place on the ice shelf near the station to help build his stamina for Muay Thai. It’s become a personal quest to prove something to himself.

“My brother says I’m way too old to do this, and he’s probably right, but I don’t believe it. I want to know for sure if it’s an age issue or a conditioning issue,” Robinson says.

In the last three years, the South Carolina native has proven that age is a state of mind, compiling a 7-3 record, muscling and grappling his way to the top of the talent pool

in Phuket. This year he’ll test his skills against nak muay in Bangkok, the center of the Muay Thai universe in Thailand.

“You go from being a big fish in a small pond, and now you’re in a bigger aquarium,” Robinson says. “You start to realize the talent pool is very deep there.”

In the end, it’s not really about the fighting for Robinson. Perhaps he’s not a Zen master, but at the very least one of those Buddhist warrior monks set out on the path of enlightenment. Certainly, there is suffering and wisdom to be found in the ring.

“When you’re actually doing it, there’s a lot of suffering involved. I liken it to the mountain climbers who go out there and climb these crazy, ridiculous mountains,” Robinson explains. “It’s really a rush to do it and succeed, but it’s painful. There’s a lot of pain involved.”

He adds: “It’s always good to learn more about yourself. I understand why fighting and battles are metaphors that people use for everything in life. It’s right up in your face. Every little mistake you make, you pay dearly for it. ... It’s the ultimate test.”

Satellite data show ice sheet melt increasing

From staff reports

Ice loss from the Greenland and Antarctic ice sheets is rising to the top as the main contributor to higher sea level.

A new study published this month in *Geophysical Research Letters*, a journal of the American Geophysical Union, says ice sheet mass loss is accelerating. Ice sheets are overtaking Earth’s mountain glaciers and ice caps to become the dominant contributor to global sea level rise, much sooner than model forecasts have predicted.

Each year over the course of the study (1992-2009), the two ice sheets lost a combined average of 36.3 gigatonnes more than they did the year before. In 2006, the total loss was 475 gigatonnes, enough to raise global sea level by an average of 1.3 millimeters. That’s compared to 402 gigatonnes from mountain glaciers and ice caps, with a year-over-year acceleration rate three times smaller than that of the ice sheets.

“That ice sheets will dominate future sea level rise is not surprising — they hold a lot more ice mass than mountain glaciers,” said lead author Eric Rignot, of NASA’s Jet Propulsion Laboratory, Pasadena, Calif., and the University of California, Irvine.

“What is surprising is this increased contribution by the ice sheets is already happening,” added Rignot, who led

a study three years ago that found ice loss in Antarctica had nearly matched that observed in Greenland.

Rignot said in a press release from AGU that if the present trends continue,



Photo Credit: Peter Rejcek

Glaciers and ice-covered peaks in the central Transantarctic Mountains.

sea level is likely to be significantly higher than levels projected by the United Nations’ Intergovernmental Panel on Climate Change in 2007. That report predicted the global sea level could rise by as much as 59 centimeters by 2100.

Since then, a number of studies have suggested that prediction is too low, forecasting sea level may grow between 1 and 3 meters by the end of the century.

“Our study helps reduce uncertainties in near-term projections of sea level rise,” Rignot said.

The study’s authors combined

nearly two decades of monthly satellite measurements with advanced regional atmospheric climate model data to examine changes in ice sheet mass and trends in acceleration of ice loss.

They found that for each year over the 18-year study, the Greenland ice sheet loss mass faster than it did the year before, by an average of 21.9 gigatonnes a year. In Antarctica, the year-over-year speedup in ice mass loss averaged 14.5 gigatonnes.

The authors conclude that if current ice sheet melting rates continue for the next four decades, their cumulative loss could raise sea level by 15 centimeters over that period. Glacial ice caps are projected to add 8 centimeters during that time, with thermal ocean expansion adding 9 centimeters. Total sea level rise could reach 32 centimeters by 2050, based on the predictions.

The authors cautioned that considerable uncertainties remain in estimating future ice loss acceleration.

The team included investigators from the Institute for Marine and Atmospheric Research, Utrecht University, The Netherlands; and the National Center for Atmospheric Research, in Boulder, Colo., which is funded by the National Science Foundation. Rignot is also a co-principal investigator on an NSF-funded project to monitor the health of the Larsen C ice shelf in West Antarctica.