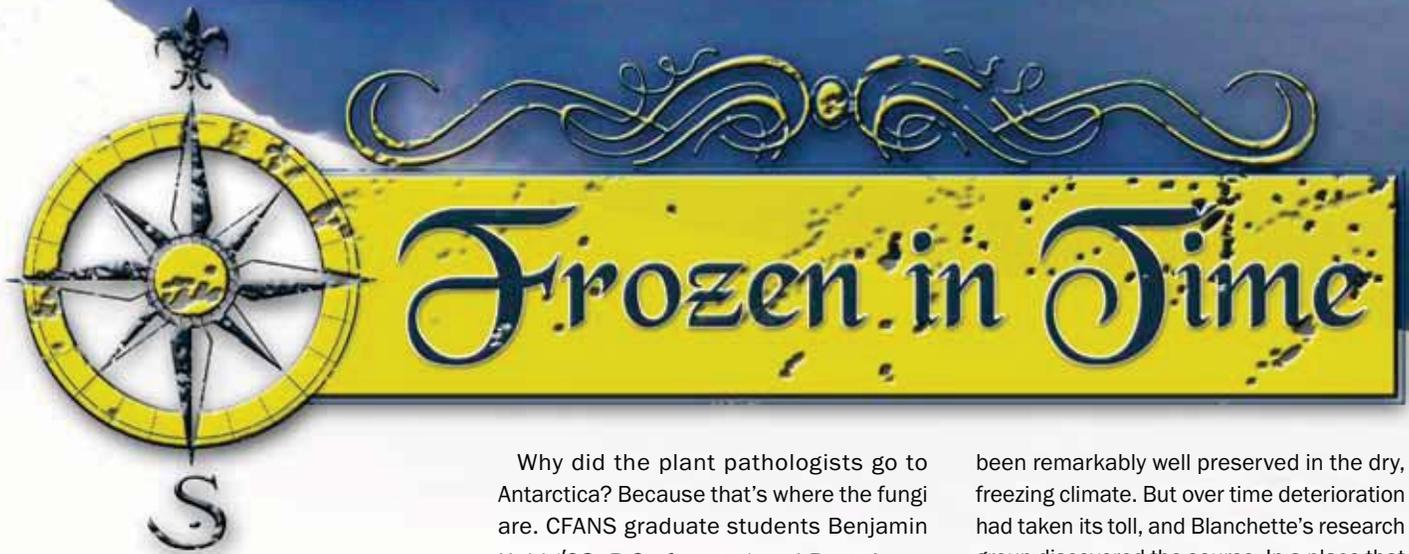


A view of Whaler's Bay from a glacier atop Mount Pond.  
Photo by Benjamin Held



## Graduate students search for new fungi in Antarctica

By Sara Specht

*The P/V Laurence M. Gould in Whaler's Bay at Deception Island, watching a group of fur seals nap.*



Why did the plant pathologists go to Antarctica? Because that's where the fungi are. CFANS graduate students Benjamin Held ('98-B.S., forestry) and Brett Arenz ('05-M.S., plant pathology) might seem like unusual passengers aboard the research ship, the P/V Laurence M. Gould, as it sailed for the frozen reaches of Antarctica, but their presence makes sense given our warming world.

This was a return trip for both Held and Arenz, members of a team researching fungi in Antarctica led by Robert Blanchette, Department of Plant Pathology professor. Blanchette's specialty is forest pathology and wood deterioration, which was what brought him here to begin with. Ten years ago representatives from the Antarctic Heritage Trust in New Zealand approached Blanchette for help identifying the cause of deterioration in several historic wood huts on the Antarctic continent.

Constructed by British explorers Ernest Shackleton and Robert Scott at the turn of the last century during the "heroic age" of polar exploration, these and other outposts had

been remarkably well preserved in the dry, freezing climate. But over time deterioration had taken its toll, and Blanchette's research group discovered the source. In a place that hasn't seen trees in millennia, the culprits were wood-degrading fungi.

In the time since, Blanchette's goal has broadened from preservation to include research into Antarctic ecosystems: what roles do fungi play, and how do they survive in such an extreme environment? The team has made yearly treks to the continent, cataloging samples of unique fungal growth, many of which had never been identified. Arenz and Held made this year's voyage with continuing grants from the National Science Foundation (NSF) to islands off the Antarctic Peninsula near South America.

### Season's end

Five months of summer come to the Antarctic Peninsula each year between November and March, bringing longer days and temperatures as high as 45 degrees F in February. Hoping the weather would hold out to ease their work with substrates buried



Right: Benjamin Held  
Below: Brett Arenz



Photo by Brett Arenz

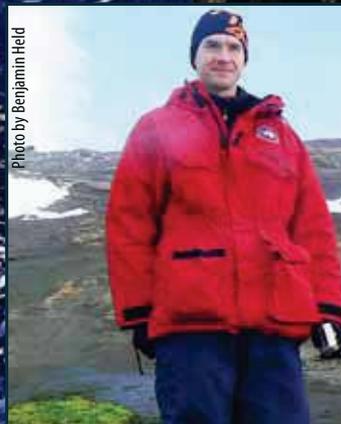


Photo by Benjamin Held

in the soil, Arenz and Held departed March 21 from Punta Arenas, Chile, aboard the NSF's last scientific voyage of the summer season. The ship took them through the Strait of Magellan and across the Drake Passage to the islands off the peninsula—a three-day journey.

"When you're crossing through the Drake to get to the Peninsula, it's the stormiest area in the world, so you can get some significant wave action going on," Arenz said just before the trip. "It's always something to look forward to. Or not, depending on how you feel about it."

Stormy seas met them at the passage, forcing the ship to take shelter on the east side of Tierra Del Fuego and costing them a day of travel. Sailing again on rough waters, the Gould made an uncomfortable trip down to the shelter of the Shetland Islands to its first stop at Deception Island. Harsh weather followed them into Whaler's Bay, normally a calm haven at the heart of the island. Winds of 60-70 knots (70-80 mph) kept Held and Arenz aboard the ship for another day. The sun set earlier each day—dark fell around

6 p.m., and they were losing seven minutes a day—shortening their window for shore excursions. Things were getting stressful.

"One thing you have to learn when you go down is that you're at the mercy of the weather," Held says. "Things go wrong, and NSF plans the events with time built in for it. We were getting kind of worried, but at the end of the trip we got an extra day at Deception Island. It all worked out great in the end."

### Extreme Living

When calmer waters finally allowed them to catch a boat ride to the bay's black sand beaches, Arenz and Held hiked up Mount Pond in search of a truly unique living environment. The bay they'd just left, part of the larger port that forms the center of the island, sits in a sunken caldera—a crater formed by a violent eruption of the volcano that forms Deception. Over half the island is covered by glaciers, and the rest of the

landscape has been created by frequent eruptions from the still-active volcano.

Midway through their climb, snow flurries and a light fog limited visibility. Passing by sheets of ice and fields of snow, they found what they were looking for: a carpet of green. Deception Island hosts many extreme

*Surrounded by snow, this geothermal site on Mount Pond produces blankets of moss and hosts a diverse mix of microorganisms.*



Photo by Benjamin Held

microclimates created by vents of volcanic heat. Near the vents the ground is baked by temperatures up to 195 degrees F, but the cooler surrounding areas exhibit some of the greatest plant diversity and abundance that has been discovered in the Antarctic.

“This was the most exciting point,” Arenz says. “We’re looking at the map trying to find the place, and it’s hard to imagine because everything is so frozen. Then right at the top was steam and green carpets of moss. It’s not what you think when you imagine Antarctica.”

Samples and soil readings taken from two geothermic sites will help the research team better understand how fungi survive in this varying, extreme climate. They know that microorganisms are fundamental to Antarctic ecosystems, Arenz says. In fact, they are some of the only organisms to be found on the continent apart from seal and penguin colonies concentrated around the coasts. But scientists know little about the biology or mechanisms they have developed to survive in a polar environment.

## Eating history

Back at the bay, Held and Arenz found treasure. Previous visits to the island hadn’t allowed enough time for thorough exploration of the wooden structures still standing here. This time they found fungi devouring wood in a pattern they hadn’t seen before. Excitement filled the air, Held says. They were anxious to get back to the lab to find out what new answers this discovery might give them.

Whaler’s Bay holds several generations of wooden structures, dating back to the first whaler’s station a century ago. After it was abandoned in the ‘30s, several nations



Photo by Brett Arenz



Held collects samples from the remains of wooden buildings on the black sand beach of Whaler’s Bay.

vied for control and built bases across the island. Eruptions in 1967 and 1969 demolished much of the construction, and subsequent volcanic activity has kept the beach unoccupied. A few buildings remain, though, in various stages of disrepair, and all of it playing host to wood-degrading fungi.

If they find enough new pieces of the puzzle in the wood remains of buildings past while studying the biology and ecology of these organisms, Blanchette’s team hopes to formulate a plan to save historic sites across the continent, like the huts that drew his attention in the beginning.

“We’re really trying to understand where they came from, and how they survive here when nothing else can,” Held says. “It’s so rewarding to look at these fungi, to solve a problem of historical significance and to have some real-life impacts.”

## Trapping Biodiversity

Palmer Station, a smooth night’s sail from Deception Island, became Arenz and Held’s base of operations for a week of the trip while the Gould ferried other researchers to complete their own projects. Taking boat rides to islands surrounding the station, the graduate students picked up the pieces of Antarctic adventures past.

On previous trips they and their team members buried sterilized pieces of wood at five different locations, to serve as bait for any hungry fungi that might be in the area. Retrieved after intervals of two and four years, the samples they collected should give the researchers a good picture of local fungal biodiversity. With the weather on their side, they managed to get to all their study sites, even when a couple territorial fur seals tried to chase them off.

Arenz plans to use the soil samples he collected to help fill in the next few chapters of his Ph.D. thesis cataloging Antarctic fungal biodiversity. The next step will be to analyze all his soil samples to try to discover what characteristics help fungi survive from one short polar summer to the next.

With more than 250 samples between them on the voyage home, many of which they said are new to them, Held and Arenz couldn’t see running out of work before the next expedition. “It’s just an incredible opportunity to see a part of the world that so few people get to see,” Arenz says. “I’ve always been interested in things at the fringes of knowledge. These fungi are definitely operating at the fringes of what we consider to be livable environments.” ■

Palmer Station houses scientists and staff year-round, and serves as a base for research trips to the surrounding islands.



Photo by Benjamin Held

Photo courtesy Wikipedia Commons



Deception Island and the port at its center are formed by a volcanic caldera, and steam vents around the island form unique geothermal environments.



Ross Island  
Scott & Shackleton Huts