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Researchers Construct New Radar Systems

In the basement of the Geophysical Institute, amid stacks of circuit boards and with a hint of solder smoke in the air, Todd Parris and Gwen Bryson hunched over work benches, building a radar system that would soon be on its way to Antarctica.

Parris and Bryson worked with Associate Professor Bill Bristow of the Geophysical Institute Space Physics and Aeronomy Group to finish three SuperDARN radar systems—one for McMurdo Station in Antarctica and two for Fort Hays State University in Kansas. The graduate students, each with electrical engineering skills, were building the instruments that researchers will use for a detailed look at the physics of the ionosphere, the uppermost part of the atmosphere located about 50 to 600 miles above Earth.

There are two SuperDARN radars in Alaska, located at Kodiak and King Salmon, and 19 more systems worldwide, mostly in the extreme north or south. Lately, there have been more installed at mid-latitudes.

"The purpose of the network is to look at (plasma) flows in the ionosphere and magnetosphere, mostly in the auroral zone," Bristow said. "Sites at the lower latitudes will catch the rest of the flow, and when there are large magnetic storms, flows move to lower latitudes."

SuperDARN is shorthand for "Super Dual Aurora Radar Network."

***CIRCUITRY**—Above and right, Gwen Bryson solders a component on a circuit board for a new SuperDARN system recently installed in Antarctica. Bryson is now employed with the Alaska Satellite Facility. Photos by Ned Rozell.*

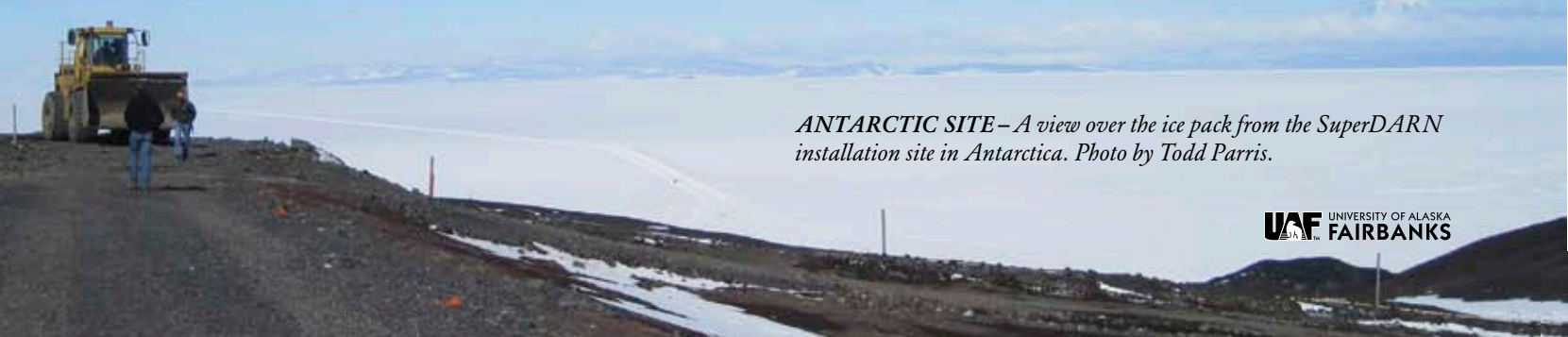
The system originated in the early 1980s at the Applied Physics Laboratory at Johns Hopkins University. A goal of SuperDARN researchers around the world is to map the invisible magnetic connection between the sun and Earth. Each SuperDARN site consists of 20 antennae along with 16 high-frequency transmitters that send pulses to the ionosphere.

"It's the only direct measure of global-scale electric fields in the upper atmosphere," Bristow said.

Parris is close to earning his doctorate in radar imaging. Bryson just finished her master's thesis on the detection of meteors using the SuperDARN array in Kodiak. Geophysical Institute Postdoctoral Fellow Jeff Spaleta developed the software for the radars.

"The network is widely used by the space physics research community," Bristow said.

With help from staffers of the Geophysical Institute Electronics Shop who installed many components on the SuperDARN circuit boards, nine of the radars are being readied to be set up from Antarctica to the Azores. The researchers will complete the additional radars within the next four years, Bristow said.



***ANTARCTIC SITE**—A view over the ice pack from the SuperDARN installation site in Antarctica. Photo by Todd Parris.*

UAF UNIVERSITY OF ALASKA FAIRBANKS

First to the Top of Redoubt

Fifty years and three eruptions ago, two Geophysical Institute professors were the first people ever to climb Redoubt Volcano in Southcentral Alaska.

Charles Deehr and Gene Wescott, along with their friends Ethan Kennel and John Gardey, summited the 10,197-foot, snow-covered volcano on August 28, 1959. Deehr and Wescott are both emeritus professors who study space physics, among other geophysical phenomena.

"We did it mainly because it was a first ascent," Deehr said. "It was unclimbed and available, and we had a chance to get down to the area in an airplane."

The party of four, which included Deehr's college roommate Kennel and Wescott's mountaineering buddy Gardey, took a flight from Merrill Field Airport in Anchorage to the sandy beach at Redoubt Point, across Cook Inlet from Clam Gulch. After they landed, they befriended a local trapper named Hank Swiss. Swiss lent them his beach cabin while they planned their ascent.

Their best approach to the glacier-capped mountain was up braided Redoubt Creek. The climbers kept their mountaineering boots dry by wading the creek many times in their canvas sneakers, which had two holes at the instep that allowed the frigid water to drain.

***TODAY**– Charles Deehr, Geophysical Institute aurora forecaster and professor emeritus of physics, pictured in December 2009 at age 73. Deehr was 23 when he climbed Redoubt Volcano with friends. Photo by Ned Rozell.*

After a few days approaching the mountain, they camped on an ice field and made a push for the summit. A reporter quoted Deehr in the Fairbanks Daily News-Miner a few weeks later:

"The 28th of August dawned bright and clear to reveal the crevasse-ridden east face. Crossing back and forth through the huge ice falls, we made the summit ridge around 9,500 feet, and reached the summit in a swirling cloud at 2 p.m."

After the climbers descended, they had another adventure as they returned to sea level and ate all their food while waiting for their flight back to Anchorage. Seeing many trout in Polly Creek near their base camp, the men created fishing lures out of safety pins and the shiny tabs from their clothing zippers. The lures worked, and they feasted on fish, clams from the beach and blueberries from a nearby hillside.

The adventure harks back to a time when the Geophysical Institute was growing fast as a result of the International Geophysical Year (1957-58). Many of the

***ASCENT**– Above, Ethan Kennel, Gene Wescott, and John Gardey ponder a route through the summit icefall on Redoubt Volcano. Right, the climbing party set up their base camp on the flank of Redoubt Volcano. Photos by Charles Deehr.*

graduate students, later to become professors, were mountain climbers, including T. Neil Davis, Charles "Buck" Wilson and Syun-Ichi Akasofu.

In addition to the first ascent of Redoubt (which erupted 50 years later, in 2009), Wescott was a part of climbing teams that were the first to scale Old Snowy, Black Cap, Aurora and Meteor peaks, all located in the Alaska Range. He and others shared the honor of naming Aurora and Meteor peaks.

In February 1959, Deehr and Wescott were among the second group of climbers to reach the summit of the Alaska Range's Institute Peak, which climbers had named for the Geophysical Institute a few years before because each of the four who made the first ascent worked at the institute.

"There were still first ascents to be done then," Wescott, who now lives in California, said. "We arrived here at the right time."

***GRAND ADVENTURE**–Top right, Ethan Kennel on the porch of a cabin owned by trapper Hank Swiss near Redoubt Volcano. Middle right, the climbers arrive on the beach at Polly Creek from Merrill Field Airport in Anchorage to begin their climb of Redoubt Volcano. Bottom right, Ethan Kennel makes one of the many crossings of Redoubt Creek required to approach the volcano. Top left, Kennel eats blueberry cobbler in Hank Swiss' cabin after the group's first ascent of Redoubt Volcano. Bottom left, Kennel and Wescott show off a bounty of fish from the backcountry. All photos by Charles Deehr.*

Soldiers Exposed to Poor Air Quality

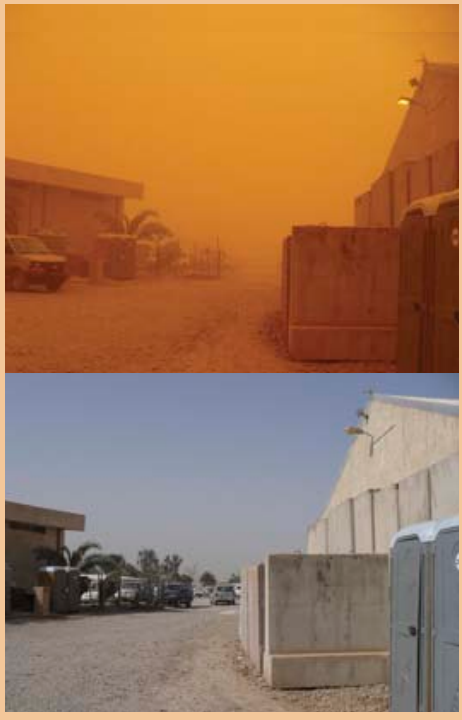
Soldiers in Iraq are breathing bad air, according to Cathy Cahill, a Geophysical Institute Associate Professor who for almost two years has monitored air quality in two camps in Baghdad. In addition to small particles blown into the air during sandstorms, soldiers at the camps are breathing tiny lead particles, probably the result of burned leaded fuel.

"We exceed the U.S. ambient air quality lead standard almost all the time in Iraq," said Cahill.

Every three weeks, Cahill receives in the mail samples coated with a sticky film that captures particles from the air at the Army camps. A few soldiers operate the air samplers for her, and she mails the clean films back, along with reindeer jerky and smoked salmon she tucks into the boxes. Her study is a joint venture with the Army and Navy to see what soldiers are breathing in combat zones.

"It's bad," Cahill says. "There's more dust in the fine (breathable) fraction than we thought, and there's also airborne lead and manganese."

Cahill's goal with her studies is to identify potential hazards to keep soldiers—including her neighbors at Fort Wainwright, in Fairbanks—safer. With the help of the military, Cahill is now expanding her efforts, setting up four more sampling stations at bases in Afghanistan, and beginning to monitor the air around military burn pits, where contractors burn trash from the bases, sending inky black smoke into the sky.



***DIRTY AIR**–Pictured above is a Baghdad Army camp during and after a sandstorm. Photos by Army Major Kevin L. Geisbert.*

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