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UIC professor tests NASA-funded robot in cold waters



Scientists from Stone Aerospace watch as an autonomous underwater vehicle named ENDURANCE is lowered for tests into Lake Mendota at the University of Wisconsin in Madison, Wis., on Thursday. The robot will be used for research in Antarctica. (Tribune photo by Zbigniew Bzdak / February 14, 2008)

By James Janega | Tribune reporter
10:35 AM CST, February 18, 2008

MADISON, Wis.

It was a seemingly simple test for an underwater robot just months from heading to Antarctica.

A team of scientists and engineers led by a University of Illinois at Chicago professor surrounded a dark hole on an icy lake, necks straining upward.

Above them, their \$2.3 million robotic probe dangled from a crane, dipping toward the cold water, where the MINI-Cooper-size robot had broken down the day before. It was a trying development for a rare cold-weather checkout before moving to a remote lake in Antarctica.

The cold might have hurt it, handlers said, or it might have been jostled on the drive from Texas. But one thing was certain: A robot heading to Antarctica had trouble last week in an icy lake in Wisconsin.

"So far, Lake Mendota has not been friendly to us, but we're going to beat it," Peter Doran, the UIC earth and environmental sciences professor who will head the project in Antarctica, said Wednesday. The robot leaves about 33 weeks from now, he said.

Bound for Earth's coldest continent, it's hoped Doran's

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robot will prove humans could one day explore still more inaccessible seas thought to exist on Jupiter's ice-covered moon, Europa. The idea has been championed by space enthusiasts and the Hollywood director and deep-sea diver James Cameron. With Europa in mind, NASA funded Doran's project along with other efforts to seek underwater life near Earth's poles.

Although hostile to people, they're cozy enough for bacteria, algae and other simple life. After chopping through several feet of ice during an earlier visit to Antarctica's Lake Bonney -- the robot's ultimate destination -- Doran sank to the dim floor of the ice-bound lake only to stir up vast living mats of brown and red microbes.

Robots can stay under longer than scuba-diving scientists and can travel throughout the lake, Doran points out. Once finished, the lake's bottom and most of its 130-foot depth will be explored by ENDURANCE, an acronym for Environmentally Non-Disturbing Under-ice Robotic ANtarctic Explorer.

"With a vehicle like this, that releases that leash we're on," Doran said. "We're going to find things that we never knew about these lakes."

Wisconsin's urban Lake Mendota is no Lake Bonney, and it is still less exotic than an ice-locked lake in the far reaches of the solar system.

But diving in Madison meant the probe's first cold-water voyages were on the University of Wisconsin campus. There was a garage where workers made repairs. Stone Aerospace programmers lined windows in a warm conference room upstairs and piloted ENDURANCE by joystick. Engineers got fast food and made last-minute runs to a local electronics store, said co-investigator Bill Stone. And outside, it was really, really cold.

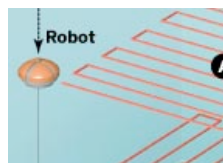
Maybe too cold.

ENDURANCE has a warm-weather pedigree. Its design is based on one for Mexican waters. It was built in sunny Austin, Texas. And last week it behaved badly under the ice. The sonar was iffy and thrusters malfunctioned. When investigators first lowered it into the water Tuesday, it floated helplessly at the top.

Engineers worked late that night and much of Wednesday to

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tinker and bypass a wiring problem. In a chilly lake research station that smelled like fish and was cramped with test tubes, mountain bikes and too many people in winter clothing, they took ENDURANCE apart and put it together again.

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Chicago Days

They had to finish testing by Friday. On Saturday, it would head to Austin.

"We're running low on time," said control systems engineer Kristof Richmond. "Stick it under the ice and see what happens."

Team members from Texas and UIC wheeled it outside. A forklift carried it across a snowy parking lot. A crane lowered the orange robot back into the shallow edge of the lake.

The robot had to work.

It is paid for. It is going to Antarctica. Plans are being made to travel 70 miles from McMurdo Station, the nearest research center, to a mountainous valley and cut away a 10-by-20-foot hole into Lake Bonney -- 3,000 cubic feet of ice, the size of a two-car garage. Into that hole goes ENDURANCE, and it has to stay there for a month.

Lake Bonney is as otherworldly as Earth gets. The salt lake is about 2 miles long and surrounded by rocky hills in a barren valley. Ice has covered it for 1,000 years or more. Only 1 percent of surface light reaches its bottom, enough to see that it is mucky with the basic stuff of life.

People -- including Doran -- have swum down, but it wasn't safe to go far. To replicate what ENDURANCE will do -- scan the lake floor this year, then come back next year and periodically study the water column -- scientists would have to cut dozens or hundreds of holes to lower instruments through the ice, which is 15 feet thick.

To avoid that, you need a robot. Ideally, one that works on its own.

When the ENDURANCE crew let it loose in cold water for the first time Wednesday afternoon, it soon got lost.

Inside its hole in the ice, ENDURANCE inspected mucky rocks, stirred clouds of algae and tore up seaweed. Logistics manager Vickie Siegel radioed directions and encouragement to the team upstairs. Camera crews on the ice watched it bump around. Doran lowered lights and a camera into the water.

Then the robot slipped under a corner and all but vanished. In the conference room upstairs, the robot's camera feed on software engineer Shilpa Gulati's laptop revealed a monotonous expanse of rocks under blue ice.

The robot is round. No one on the ice looking at the edge of it could tell them which way was forward. No one knew where the hole was anymore.

Finally, Gulati saw the lights from Doran's camera and called for pilot Mohan Sridharan to stop.

"Head for the light!" someone exclaimed.

ENDURANCE bobbed up in the dark water again. Someone said they were glad the day didn't happen in Antarctica.

"No disasters, so that's good," design engineer Bart Hogan said. "Baby steps today. A little more maneuvering tomorrow."

Thirty-two weeks and six days until Antarctica.

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