

Robot endures Antarctic cold to prepare for space mission

December 26 2008, By James Janega

A NASA robot tested last winter in an icy Wisconsin lake will complete a monthlong underwater mission in Antarctica on Thursday, having successfully explored dark, deep waters frozen off from the outside world tens of thousands of years ago.

Managed by a team from Chicago and Texas, the robot has hit its marks while patrolling Lake Bonney, a body of water locked under 15 feet of ice. The Antarctic lake is the nearest thing on Earth to outer space, and scientists hope lessons learned there will inform a future hunt for life in the ice-covered oceans of Jupiter's frozen moon Europa.

The robot overcame some technical surprises to gather information on the lake's internal structure - data many Antarctica experts once despaired of knowing - and spot a colony of microbes unlike any seen before.

Scientists named the robot ENDURANCE (for Environmentally Non-Disturbing Under-ice Robotic ANTarctic Explorer) in a nod to the ship Sir Ernest Shackleton was forced to abandon on his failed Antarctic expedition a century ago.

The device patrols under the ice like a \$5 million Roomba robotic vacuum cleaner while a pair of scientists with tracking antennas follow it across the ice above like overprotective parents.

Its only way out of the lake is a single, cubicle-sized hole in the ice that

is guarded by researchers from the University of Illinois at Chicago. A fiber-optic cable is the sole lifeline that connects the robot to scientists waiting by the hole in wood-floored tents.

ENDURANCE was built by Stone Aerospace in Austin, Texas, from a design used for Mexican waters. When it first explored cold water in February at Lake Mendota in Madison, Wis., the sonar was iffy, thrusters balked, and it barely found its way back to the starting point.

Even after the robot arrived in Antarctica, some of its crew wondered if it would even work, said co-investigator John Priscu of Montana State University.

But in Antarctica, it motored flawlessly to all its destinations - determining its own routes underwater, evading obstructions and returning by dead reckoning to the team of relieved scientists.

The mission was not without challenges. Engineers at the site modified equipment not designed for cold water, programmed "danger zones" into the robot's memory when it found dangling old ropes and lost science instruments, and found ways to work around the surprising buoyancy added by gas bubbles in the lake.

As it hovers under the ice, the robot spools out a series of instruments every few minutes that measure water temperature and dissolved materials as well as taking pictures of the ice above and the dark lake floor below. Days after it began, the robot found what looked like an outcrop of lichen-covered rocks - microbial colonies that researchers said were unlike any others known to exist in the lake.

"There's some things in these images that I've never seen before," said investigator Peter Doran of UIC.

It also revealed details of what is essentially an ancient salt lake trapped under lighter, cold freshwater and a thick slab of ice, Priscu said in an e-mail from Antarctica.

"At this stage of the game, I would have to call ENDURANCE a success," he said.

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