



Student-built explorer unlocks Lake Ontario secrets

It's designed to explore the depths of large bodies of water – and this past summer it reached the bottom of Lake Ontario.

The underwater remote-operated vehicle (ROV for short), the senior design project of a team of RIT engineering majors, has been described as one of the most ambitious and challenging RIT student projects ever. Last spring and summer, the device explored century-old shipwrecks resting on the floor of Lake Ontario.

The RIT team was led by Dan Scoville '05 (electrical engineering), an experienced scuba diver who, with Jim Kennard, examined four Lake Ontario shipwrecks this year. The duo has located and explored five “virgin” (previously undiscovered) shipwrecks in Lake Ontario in the past five years.

The ROV's maiden Lake Ontario expedition was a return visit for Scoville to the St. Peter, a 125-foot-long, three-masted schooner resting 115 feet deep offodus, N.Y. The craft sank more than 100 years ago while carrying a load of coal and a crew of about a half dozen. All except the captain perished.

“Visibility was so good that we didn't need artificial lights,” Scoville recounts. “I'm happy to report that all the sensors and functions of the ROV worked extremely well on its first dive.”

Next, Scoville and Kennard glimpsed the first images of two vessels off the coast of Rochester. One of them – a schooner not seen since the mid-1800s – was a surprise discovery.

“This ship, more than 200 feet deep, is one of the best preserved wrecks I have seen,” Scoville says. “Both the masts are still towering upward toward the surface and there is no major structural damage. But we don't know the ship's name because it turned out not to be the ship we were searching for.

“The second ship we explored for the first time with the ROV is more than 250 feet down. The wreck sank in a collision with another ship and is badly broken up – just a jumble of wreckage.”

Another sunken craft Scoville and Kennard examined was a 100-foot-long schooner originally discovered about five

years ago by explorers using sonar off the coast of Oswego.

“It was a long way down, but I found the shipwreck intact and sitting upright on the bottom,” Scoville recounts. “The ship's wheel is in perfect condition. The ship's masts have fallen due to the supporting ropes rotting away, but other than that there was no obvious damage to the ship.

“The good news is that the ROV operated really well at 350-plus feet deep. This depth is only 50 feet from our intended design limit and I was very happy to see everything go so well.”

Scoville, originally from Palmyra, N.Y., backed the ROV project out of his own pocket. He says locating and document-

Above: Dan Scoville '05, left, and Matt Paluch '06 prepare to test a remote-operated vehicle in Judson Pool in the Gordon Field House and Activities Center. The device, designed and built for an engineering senior design project, has since been used to explore Lake Ontario shipwrecks. (Photo by Greg Francis)

ing shipwrecks is important due to their connection to the area's maritime history. Lake Ontario, he adds, is a huge but vastly underused resource for learning about watercraft from a bygone era and the technology used to find them and preserve their histories.

Some of the fewer than 1,000 ships lost in Lake Ontario have been discovered and salvaged, while others are in water too deep to explore, Scoville says. That leaves a small number – perhaps a dozen – in an area from the Niagara River to Oswego in the 100-to-400-foot depths that are accessible to explorers such as Scoville and Kennard. But they're not easily found.

"We do it because we love doing it," says Scoville, an electrical engineer with Henrietta-based Hydroacoustics Inc. and a scuba

diver for about 10 years. "When you find one, it's neat. It's a really cool experience."

Even after shipwrecks are located they can't be salvaged, Scoville adds, because those between the shores of New York and the international line are considered state property.

Scoville has twice visited the Undersea Research Center at the University of Connecticut, where he received advice on how to improve the RIT-built underwater explorer. He may join center researchers on an expedition next year to the steamship Portland, which sank off the coast of Gloucester, Mass., in 1898.

The small, 60-pound, battery-powered remote operated vehicle was designed and built over two academic quarters. It is

equipped with up to four removable video cameras, four high-intensity lamps, a navigational compass, a timer, and sensors to measure depth, pressure and temperature. Four variable-speed motors enable vertical, forward and reverse movement and turning maneuverability. RIT students custom-built most circuit boards, wrote the software and created the graphical user interface used to control the device. All components are housed in watertight canisters; the lightweight aluminum frame is rugged and modifiable.

The explorer is controlled by a joystick attached to a laptop computer that communicates with a microprocessor (the vehicle's "command center") via a 680-foot-long fiber-optic cable. A human at the controls topside sees what the ROV encounters underwater through live streaming video and sensor readings.

The device is capable of diving at about two feet per second to a depth of 400 feet – about twice as deep as a skilled scuba diver can descend. A foam top helps achieve neutral buoyancy, enabling the ROV to remain level while submerged. A 100-minute battery life allows it to stay underwater longer than human divers. Future enhancements may include the addition of a mechanical arm and extended diving capability – perhaps enabling the explorer to reach Lake Ontario's maximum depth of about 800 feet.

Building the ROV cost about \$15,000. An equivalent commercially made underwater ROV would cost \$20,000 to \$50,000, Scoville says. He describes the students on his team as skilled, practicing engineers.

The team members, who all graduated in May 2006, are: Jason Caulk (electrical engineering), Josh Figler (computer engineering), Scott Gerenser (computer engineering), Antoine Joly (electrical engineering), Chris Nassar, (electrical engineering), Matt Paluch (electrical engineering), and Lawrence Shaver (mechanical engineering).

"I lucked out with a really good team," Scoville says. "We were told it couldn't be done."

Michael Saffran

W Web extra:

For more photos, visit the University News Services Web site at www.rit.edu/news. For more on Scoville and Kennard's discoveries, including video showing shipwrecks they've located, visit www.shipwreckworld.com/stories/209.aspx www.shipwreckworld.com/stories/298.aspx

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Dan Scoville '05



The steering wheel of the Etta Belle, which sank in Lake Ontario off Sodus Point in 1873. The vessel was discovered two years ago by a team including Dan Scoville '05. Since last spring, Scoville has been using an underwater remote-operated vehicle built by a team of RIT engineering majors to search for and explore other Lake Ontario shipwrecks. (Photo by Dan Scoville)