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# A New Wave of Ocean Explorers

*Aquatic robots uncover the mysteries of the high seas*

By HOLLY FINN



Liquid Robotics

Wave gliders collect data from our still largely unmapped oceans.

The critter looks like a tiny turtle, but with a shell shaped like a hockey puck. Maybe, though, it is just a strange little wet bird. Or could it be a Gooseneck barnacle? In the photo—transmitted from the middle of the Pacific Ocean—you can't clearly identify the stowaway. You can just see it

clutching the top of the Wave Glider, in stormy water, like he'll never let go.

The Wave Glider is the first autonomous device to turn ocean waves into energy: a robot for the sea. It looks like a surfboard, only cooler. The fiberglass hull glides on the surface, with solar panels to power its electronics and sealed boxes to protect data-gathering instruments. Connected by a tether, submerged 20 feet, are spring-loaded flippers. They absorb the sea's energy, convert it to thrust and propel the machine.

The ocean is 71% of the planet. It produces 75% of our oxygen, and eight out of 10 people live within 60 miles of it. Still, we know nearly nothing about our watery world. Right now there are only 1,500 data-sensing buoys floating on all the oceans. That is one data point for each stretch of water the size of California. Less than 10% of the oceans have been mapped.

"My question is: Why are we ignoring the oceans?" asked Robert Ballard four years ago (he discovered the sunken wreck of the Titanic). NASA's funding today tops \$17 billion, while that of the National Oceanic and Atmospheric Administration hovers under \$6 billion. But a seafaring competitiveness is kicking in, among moguls and beyond. Deep Ocean Exploration and Research, with funding from Google's Eric Schmidt, is

building two three-person submersibles. James Cameron, the director of "Avatar," and Richard Branson, with Virgin Oceanic, are each planning to head for the deepest seas of the western Pacific with single-person subs that travel hundreds of feet a minute. It's up for grabs, who will be first to descend to the bottom of the legendary Mariana Trench and back, in roughly the time it takes to drive from San Francisco to Los Angeles.

Meanwhile, few are exploring the surface. So when the four Wave Gliders of the PacX project reach Hawaii next month, after their November launch from California, it will be a coup for curiosity. Using Google Earth, some 1,500 oceanographers, biologists, meteorologists and enthusiasts are following the expedition. After Hawaii the PacX gliders will head on to Australia and Japan to join up with Virgin Oceanic.

Crossing expanses never remotely surveyed, they will gather 2.25 million data points about salinity, water temperature, waves, weather, fluorescence and dissolved oxygen. All the information is available free, and there's a Challenge Prize for the best use of it.

"We don't know what interesting things are in the data," says Ed Lu, chief of innovative applications at Liquid Robotics, the maker of the Wave Glider. The team has already seen swirling patterns in the currents, which may affect models of climate change.

A new generation of aqua-bots could also enhance port security, improve shipping routes and, in grids, act as swimming weather stations. "A lot of our global climate measurement is based on spacecraft and 30 years old," says Mr. Lu. "This is way cheaper than a spacecraft." Liquid Robotics, which has made 100 gliders so far, includes energy companies and marine protected areas among its customers and charges between \$1,500 and \$3,000 a day for data delivery.

Last month, the PacX four got caught in a storm with 26-foot waves, winds up to 115 miles an hour, and pressure as low as the eye of a hurricane. A family nearby had to be rescued by a container ship. But the gliders came through.

Imagine the next Katrina or Andrew. We currently can gauge a hurricane's path but not its strength. Evacuation remains a judgment call. You need data on waves, winds and temperatures to predict whether an eye will intensify—but nobody wants to send a ship into danger. Oceanic robots could finally tell us whether it is safe to sit tight.

So as the PacX four and others concentrate on their daring reconnaissance of our oceans, we should cheer them on—if only from afar. Sea critters may not heed it, but each Wave Glider has a clear black-and-white sign on its hull: "PLEASE DO NOT DISTURB."

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