Sensors May Reveal Ocean Secrets

<table>
<thead>
<tr>
<th>Words to Know:</th>
<th>Dictionary says ...</th>
<th>In my words ...</th>
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<tbody>
<tr>
<td>SENSOR</td>
<td>a device that responds to a physical stimulus (heat, light, sound, pressure, magnetism, or motion) and transmits a resulting impulse (a measurement or to operate a control)</td>
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<tr>
<td>Pronunciation: SEN-sor</td>
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<tr>
<td>Function: noun</td>
<td></td>
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<tr>
<td>Etymology: Latin sentire to perceive + English -or</td>
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<tr>
<td>DISSIPATE</td>
<td>1 : to break up and scatter or vanish 2 : to spend or use up wastefully or foolishly</td>
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<tr>
<td>Pronunciation: DI-si-pat</td>
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<tr>
<td>Function: verb</td>
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</tr>
<tr>
<td>Etymology: Latin dis- + supare to throw</td>
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By Jan TenBruggencate, jant@honoluluadvertiser.com.
Advertiser Science Writer

What happens when waves and currents hit a Hawaiian reef — where does all that energy go? What effect does the moving water have on the reef structures and sand beds? And how does all that change life on the reef?

A team of University of Hawai‘i scientists plans to install a multi-part sensing system on the sea floor off Kaka‘ako to get some answers to those and other questions.

Chemical oceanographer Frank Sansone, ocean engineer Geno Pawlak, geochemist Eric De Carlo and biological oceanographer Margaret McManus — all with the university's School of Ocean and Earth Science and Technology — recently were awarded a $2 million grant. Kilo Nalu, an underwater ocean observing system, aims to study physical, chemical and biological processes in water from 30 to 120 feet deep off Kaka‘ako.

Sansone said there is an undersea cable that runs from the shore to the west of Kewalo Basin's entrance out to water about 30 feet deep. The cable gets power out to underwater instruments, and gets data from those instruments back to...
shore. The researchers' plan is to extend the cable into deeper water, and to put scientific instruments at different depths.

"If you really want to know about what is going on in the natural cycle, you want sensors in the ocean," he said.

Each of the scientists is looking at different pieces of the puzzle, but the pieces connect to one another.

"Unless you're looking at all of them, you're going to miss a lot of the story," Sansone said.

One part is how the energy from waves and currents is dissipated on reefs and how the structure of the reef creates friction that robs the water of that energy. Another is how changes in temperature, salinity, density and other features of the water affect the way the nearshore environment works. And then there is the role of the sand and the reef as a great filter.

Material, such as dead seaweeds and animals, falls to the ocean floor and is buried in the sand. There, it turns to compost as microorganisms break it down into nutrients for living systems on the reef. When waves and currents hit the sea floor, they cause water to flow through the sand. This creates a vast pumping force — driving the nutrients into the water column.

Pawlak said the group's instrument packages measure temperature, current strength, density, chemistry and much more. Added information about the reef will come from an underwater robot that can be programmed to swim out and gather data before returning to shore. A boat will be used to drop sensors to pick up information in areas away from the Kilo Nalu sensors. And satellite information will provide large-scale data on what's going on in the larger picture, Pawlak said.

De Carlo said some sensors will be located just above the bottom and others beneath the sand.

"We want to understand the chemical processes that take place at the benthic boundary later," he said, referring to the region on the sea floor where water meets rock and sand.

The Kaka'ako site is useful because there's already a cable there, but also because it has highly variable wave conditions, occasional runoff events, access to deep water fairly near shore and other features.

"It's a miniaturized version of a continental shelf," Sansone said.
Respond to “Ocean Sensors” Reading

True or False? Write & then discuss your answers.

_____ 1. 4 different kinds of scientists work on this project.
_____ 2. These scientists get to work with robots.
_____ 3. These scientists do all their work in labs at UH.
_____ 4. A benthic boundary is like a mini continental shelf.
_____ 5. Kilo Nalu is a satellite that gets data to scientists.

Guided Discussion: Write what you find most interesting about this reading & then share with the class.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Respond: Think about the 2 questions below & answer 1
(Do both for bonus points!)
1. Do you think it’s a good thing this project got $2 million to do its work? Why or why not? Write notes here & then share with the class.
2. Ask a classmate which of the science jobs mentioned in this reading they would like to try and why.
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Word Power! Look up another word you don’t know in this reading.

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Science in Hawai‘i: Nā Hana Ma Ka Ahupua’a – A Culturally Responsive Curriculum Project Retrieved 9/26/05 and adapted from: http://the.honoluluadvertiser.com/article/2005/Sep/26/ln/FP509260325.html