What Lies Beneath

Caron studies potentially deadly algal blooms with improved detection system

In partnership with scientists in the USC School of Engineering, Caron is part of an interdisciplinary team led by Ari Reguicha, professor of computer science, that aims to build a fleet of miniature, smart bioensors to monitor the growth of toxic algae in the ocean in real time. In the project’s first step, a miniaturized version of the immunological test — or other sensing techniques — may be fitted into small seaworthy robots to sense a blooming event.

The team’s long-term goal is to develop an autonomous network of hundreds of free-swimming nanorobots, each able to sense the size of a microorganism, which would automatically alert agencies and researchers to an HAB.

HABs can lead to toxic shellfish poisoning in humans that, depending on the specific algal species, cause flu-like stomach ailments, temporary amnesia, disorientation, paralysis or even death.

In collaboration with the USC School of Library and Information Science, Caron is a part of the Nose and Trenching project, a collaborative effort between the USC Libraries and the Los Angeles County Department of Public Health. The project aims to provide access to a collection of materials related to the history of the city of Los Angeles, including maps, photographs, and other archival materials.
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tor and other devices.

In theory, the process, in combination with the development of smaller robotic sensors and new software systems, could be used to build a nanorobot with electrical and mechanical components to propel itself, send electronic signals and even compute. While individual nanoscale robots would have far less computing power and capability than full-sized devices, a vast number of them operating in concert could accomplish sophisticated tasks, much like an army of ants.

Creating the algorithms that will enable the coordination of so many robots falls under the expertise of robotics researchers Guarré Súkhahme, assistant professor of computer science, and UCLA's Deborah Estrin, a former USC computer scientist, directs the Multisensory Center for Embedded Networked Sensing.

Supported by a $1.7 million grant from the National Science Foundation, the team is now in the second year of its project, titled the M3-system—an acronym for the Marine Microbe Monitoring system. (Caron, only half joking, refers to it as the "rubber-duck system," envisioning an armada of tiny robots floating around like rubber ducks in a tub.) This spring, the team succeeded in building primitive robotic sensors—resembling white plastic ball-point pen caps—that show signs of simple intelligence. They can sense water temperature, adjust their vertical positions cooperatively, communicate with one another and send data to a computer. While the sensors still number only eight, and they are not yet free-swimming (they are tethered in a water tank), they represent real progress.

Talking about the team's work, Caron is clearly surprised and delighted in entering new waters—filled with robots and computer networking systems. "Not in a million years would I have expected to find myself working on a project like this," he says.

—Ella Emerson with Rob Colkerley, USC School of Engineering

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Pakistan and Yemen," says the USC award winner with "a reawakening of interest in Los Angeles neighborhoods," says Roseman, who works with graduate and undergraduate students to create the print and electronic map series.

"These maps have a great variety of uses," she says. "In many ways they have contributed a reawakening of interest in Los Angeles neighborhoods," says Roseman, who works with graduate and undergraduate students to create the print and electronic map series.

"The information helps shed light on a number of close-by resources, including some historical properties many people did not know existed until the maps were published."

Two-mile radius around the USC Park Campus houses the largest concentration of historical structure in the City of Los Angeles," says Roseman. "In those same streets there are dozens of religious institutions, including a Buddhist temple, a mosque, two Mormon facilities, and a great variety of Christian churches. The area is rich in history and culture." Using census data from as far back as 1980, Roseman's work portrays the social and demographic fabric of the community, creating a "living document" that helps inform the social sciences.

Currently, he is working on a new project: a series of maps that detail the area around Health Sciences Campus.

—Nicole S. S. Roseman

reason why USC students like hers are so successful at winning scholarships. Several hallmarks of the undergraduate experience—particularly encouragement of multidisciplinary study and engagement in community service—are attractive to students who are not natural candidates for the Truman Scholarship," she says.

Also, because USC students have so many ways to participate in activities on campus and in the community, many are able to demonstrate leadership skills, says Harrison. "USC is drawing more high-achieving students than ever, who are ready to give to the community in support of the Schmidt Foundation. In addition, USC is attracting more high-achieving students who are interested in working in the political sciences. USC's success in winning the scholarships is due to the fact that it is a top-rated university in the nation, and the students who win are those who are ready to give back to the community."