

NEWS

- [Local](#)

- » [Weather](#)
- » [Columbine](#)

- [State](#)

- [Nation](#)

- [World](#)

- [Politics](#)

- [Education](#)

- [Census 2000](#)

- [Opinion](#)

- [Columnists](#)

- [Lottery](#)

- [Commuting](#)

Ready, set, **teach!**

Three newcomers to the teaching profession test their knowledge and experience against the reality of the classroom.

[Click here.](#)

▪ Does Colorado prepare teachers well? [Talk teaching in our forum](#)

Special reports

In-depth and investigative reports from the pages of the Rocky Mountain News. [Click here.](#)

Multimedia

Video, 360-degree photography and other multimedia news coverage. [Click here.](#)

Databases

Learn more about your neighborhood, city and schools with our searchable databases.

- [Terrorist victims](#)
- [Election 2001](#)
- [2000 Census](#)
- [CSAP results](#)
- [T-Rex construction](#)
- [Sex offenders](#)
- [Crime comparisons](#)
- [DPS ethnicity](#)
- [School report cards](#)

Denver Square

[PRINT THIS STORY](#) | [E-MAIL THIS STORY](#)

Exoskeleton in the closet

It's no claws for alarm -- lobsters' family secrets may result in robots with compound eye on danger

By **Jim Erickson**, News Science Writer

BOULDER -- The twitching antennae of lovelorn lobsters could provide clues for engineers trying to design robots that search for land mines, submerged toxic waste and anthrax spores in offices.

With grants from the Office of Naval Research, University of Colorado engineer John Crimaldi and his California colleagues are probing the mysteries of "lobster sniffing," the rapid flicking of antennae the clawed crustaceans use to get a whiff of potential mates and food.

"This animal that barely has a brain can perform these extremely complicated search mechanisms with an extremely high degree of efficiency," said Crimaldi, an assistant professor of civil and environmental engineering. He came to CU last year from Stanford University.

"And the reason they're so good is not because they're really smart," he said, "but because they've evolved, over a tremendously long time, the ability to do one thing very well."

To learn how the Caribbean spiny lobster sniffs out odors on the murky sea floor, the researchers built a synthetic lobster.

They poured epoxy into a hollow shell left behind after one of the creatures molted. Then they installed tiny motors in the lobster head and attached real lobster antennae to the motors.

The epoxy lobster was dunked in a water tank, and fluorescent dye was released at one end to simulate a plume of odor molecules flowing through the water. The dye was bathed in laser light to make it glow brightly.

As the dye flowed past the epoxy lobster, the researchers triggered the antennae motors repeatedly to make them twitch. The event was recorded with a high-speed digital camera.

The downward flicking motion appears to capture odor molecules and load them into sensory cells on tiny hairs that line the antennae stalks, the researchers report in today's edition of the journal *Science*.

Engineers began emulating nature long before the Wright brothers took off from Kitty Hawk, and today the practice is known as biomimicry. Crimaldi and his colleagues hope to apply their lobster lessons to the design of robots that could locate and track objects by smell -- on land or underwater.

The robots would be particularly useful in situations that place humans in harm's way. The robots could potentially get a whiff of TNT leaking from land mines buried in a field or track down unexploded bombs on the sea floor.

They could even be enlisted in the war against terrorism, venturing into buildings where a release of biological or chemical weapons is suspected, Crimaldi said.

Primitive versions of the robots already exist. Working models should be in operation within a decade, Crimaldi said.

"In studying these processes, I've learned to have an incredible amount of respect for the evolutionary process and how powerful it is in producing an intelligent piece of natural engineering," he said. "Evolution, in the end, is all about efficiency."

The lead author of the *Science* report is Mimi Koehl of the University of California at Berkeley. The other authors include Crimaldi and researchers from Stanford and Bowling Green State University in Ohio.

Contact Jim Erickson at (303) 892-5129 or ericksonj@RockyMountainNews.com.

November 30, 2001