

## SHORT FORM

### SMALL BUSINESS

#### Two new NH businesses

In Hampton, the **Community Oven** opens its doors on Route 1, specializing in wood-fired flatbread pizza.

In Manchester, acupuncturist John Lazott opens **Eastern Approaches** to practice Chinese and Japanese styles of acupuncture, Oriental medicine and Medical Tui Na.

► Page C8

### CALENDAR

**New Hampshire Business Calendar.**

► Page C8

### PHILANTHROPY

#### Help is all around

Almost \$32,000 in cash — part of that going toward \$1.2 million for veterans — plus 1,200 dictionaries for schoolchildren are among this week's roundup of recent philanthropic efforts by Granite State companies and individuals.

► Page C2

### CAREERS

#### Awards, appointments

**Robert Harbeson** joins boards for Area Home Care & Family Services Inc. and Great Bay Kids Co. ... **Dr. Robert Leonard** joins North American Hair Research Society ... **Jason Kroll** appointed to the board of directors for the New Hampshire Children's Museum ... Cheshire Medical Center/Cheshire Health Foundation names new board members **William Kelleher**, **Mary Ann Kristiansen**, **Geoffrey Molina** and **Gregg Tewksbury**.

► Page C3



Ken Steinberg, owner and CEO of Cambridge Research and Development in Nashua, talks about the product he is launching — a haptic interface — that allows users to feel the touch and pressure applied by a robot while it works. Robotic devices are being used more and more as science develops uses in medicine, law enforcement, deep-sea exploration and other scenarios where robots can take the place of humans.

THOMAS ROY PHOTOS/UNION LEADER

# New touch in robotics

◆ **Hands-free development:** New technology allows an operator to feel what a robot is doing.



The system combines a pneumatic air pressure-measuring device attached to the back of the head, and relays steady pressure the user can feel as a robot touches or grabs an object. During testing, squeezing the measuring device produces immediate reaction from the apparatus; the harder one squeezes, the more pressure is felt.



**I Just Work Here**

Rex Huppke

## Vampires in the workplace

EVERY WORKPLACE is required by federal law to employ at least one individual who is spectacularly irritating. That's an incontrovertible (made-up) fact.

Whether you're a decorator or a litigator, probably even if you're an alligator, there's someone around to tax your nerves and, through bullying or back-stabbing or micromanaging, drain your will to live.

I have a name for these people, but it's quite long and contains profanities that haven't even been invented yet. Al Bernstein, a Portland, Ore.-based clinical psychologist, has a considerably better name: emotional vampires. "They are everywhere," Bernstein said.

The good doctor first published "Emotional Vampires: Dealing With People Who Drain You Dry" more than a decade ago. He has an updated version coming out soon and is working on a new book that focuses on workplace vampires, the living dead who haunt our days.

Behind many of these faux-fanged fools, Bernstein said, there is likely some form of personality disorder.

"When we talk, we try and represent what the actual truth is or what's going on inside," he said. "But people with personality disorders are always trying to elicit an effect. They're always thinking, 'What will it take to get you to do what I want you to do?'"

Crafty vampires.

While tales of glamorous blood-

► See Huppke, Page C3

By DENIS PAISTE  
New Hampshire Union Leader

Cambridge Research and Development of Nashua has developed a new module that lets operators feel the pressure they're applying via a robot, while leaving their hands free.

Robots are used everywhere from the operating room to crime scenes to the bottom of the sea.

A robot was employed in the early morning hours on Friday, April 13, to learn what was happening inside a Greenland home where Police Chief Michael Maloney and four other officers were shot by a suspect who later killed himself. Maloney also died in the incident.

The problem with robots is that, without sensory feedback, robot operators don't know if they are applying force equivalent to picking up a grape or picking up a bowling ball. Cambridge R&D's new product goes a long way toward differentiating between the two extremes.

Inventor Ken Steinberg, CRAD's owner and chief executive, said, "What we wanted to do was to provide a sense of tactile feedback to a robotic operator in a way that did not impact their hands, that was going to be completely out of the way."

During research, Steinberg determined that any such feedback would also have to be proportional, and it would have to be usable in many different robotic applications.

The potential market for the device is "anywhere where you've got a man-machine interface and the machine is doing the work of a human and (the human) needs to feel it," he said.

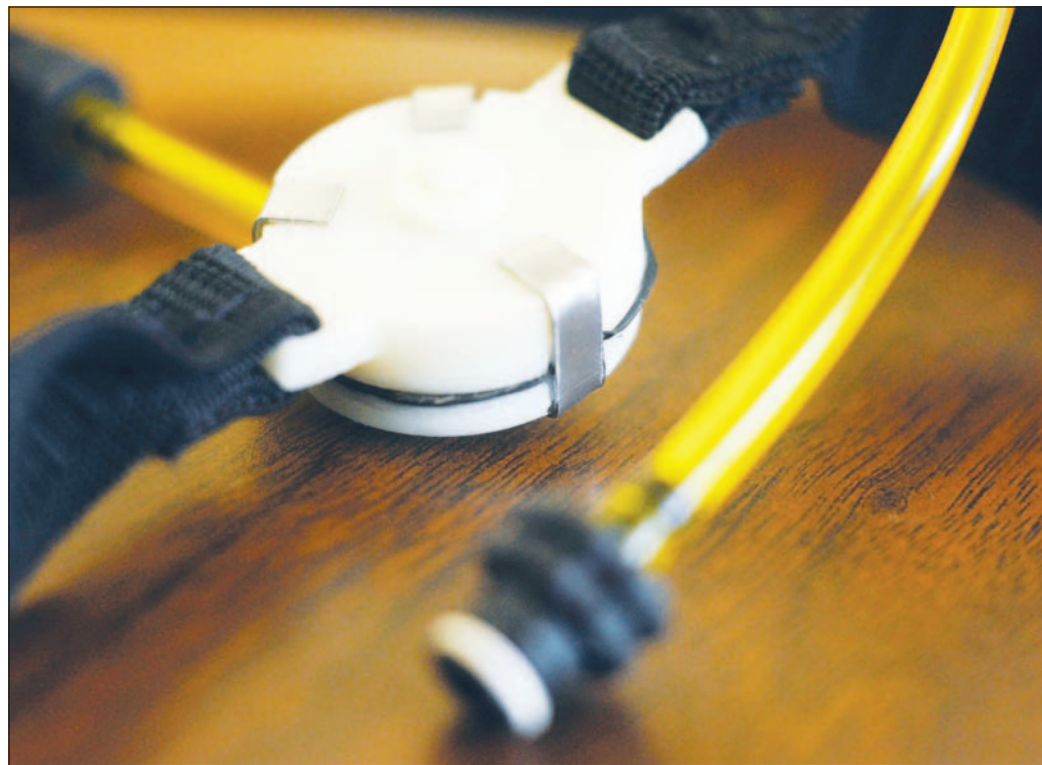
#### Granularity

Steinberg demonstrated the device for a reporter and photographer at the offices of the New Hampshire Union Leader last week.

Steinberg and partners, Mike St. Amant, vice president of operations, and Jason Clark, vice president of engineering, have a provisional patent on their innovation. The team spent two years developing the pressure-sensitive system.

The system combines a pressure measuring device the size of a dime with a pneumatic air pressure system that controls a diaphragm-activated dual chamber system about the width of a quarter and quarter-inch thick.

"The innovation comes in the application of the compressed air and



Steinberg's dual-chambered air pressure system, worn on the head of a surgeon or other robot operator, is called a haptic interface, which allows users to feel the pressure applied by a remote mechanical robotic device.

designing this dual chamber system that gives us that fine level granularity," he said.



STEINBERG

In the center of the diaphragm is a pin about the diameter of a pencil that is pushed out as pressure increases.

For the demonstration, Steinberg had the diaphragm attached to a headband, placing it at the base of the skull where sensitivity has little interference.

Squeezing the measuring device produced immediate reaction from the diaphragm. The harder you squeeze, the more pressure you feel on the back of your head.

"A pneumatic actuator is something you might find in other production environments, but the coupling of this with the fine level granularity is critical," he said.

Used with a surgical robot, Steinberg said, "Now the surgeon's hands aren't impacted, but as the robot's grabbing onto a vein and pulling a suture, he can now have the dexterity of his hands but still feel what the robot's feeling in other locations on his body without vibration or without resistance."

"One of the problems we have nowadays is there is no way to have a real man-machine interface. The minute you try to interface machinery and break the epidermis (skin), you create sites for staph (bacterial infection)," Steinberg said.

"... A vibrating motor is not something you'd want on a surgeon's hands or bomb tech's hands."

KEN STEINBERG

Cambridge Research and Development, Nashua

#### Sensory feedback

The field of translating the feel of a machine to a person is known as haptics. Anyone who has felt the vibration of a video-game control has experienced haptics at work, Steinberg said.

While the demonstration model uses air pressure pneumatics, it could also be controlled by current fluctuations.

"So this whole concept of haptics is an interim step between somebody eventually solving the ability to have a true man-machine interface, which doesn't exist today," he said.

Experts in the field have been grappling with the sensory feedback issue for several decades.

About a half-dozen companies are selling haptic devices with varying levels of sophistication, according to Ralph Hollis, research professor in the Robotics Institute at Carnegie Mellon University in Pittsburgh.

"In haptics, especially related to surgical applications, it remains to be proved whether the system, whatever it is, is efficacious or not and proving that is very hard to do," he said.

Many robots today provide feedback by providing resistance to the user. "The problem is that when a surgeon or somebody is trying

to control a robot, they want their dexterity, so resistance at the hands, anything that impedes their hands, is inherently dangerous," he said.

"Same thing with a bomb tech. You wouldn't want a bomb tech having too much interfere with their use," he said.

"Some of the more recent innovations have involved putting vibrating motors on surgeons' hands, and that's not something you'd want on a surgeon's hands or bomb tech's hands. You don't want their hands vibrating," he said.

"Basically all you have in the industry right now is either vibration or resistive elements," Steinberg said.

Vibration is problematic in longer term applications, such as artificial limbs, because a vibrating motor placed against the skin for a long period of time calluses the skin and causes a loss of sensitivity, he said.

Cambridge Research and Development files four to six patents a year in areas from software to fire safety to HVAC control to robotics, he said.

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