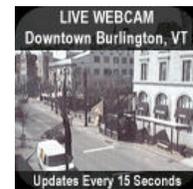


**Become a Free Press Carrier**  
 Make Money Driving Your Car [CLICK HERE FOR MORE INFO](#) **Burlington Free Press**  
 A LOCAL CUSTOM



Free Press SEARCH brought to you by: **Comcast**

SAVE 20% AT SOME OF THE AREAS BEST RESTAURANTS!  
 CLICK HERE FOR DETAILS  
**PressPass**  
*a la Carte*

**Top Stories**

Friday, May 18, 2007

Top Stories Archives: Sun Mon Tue Wed Thu Fri Sat ■ NewsWeek  
 Contact News Department

- Home
- NEWS**
- Top Stories
- Local
- Sports
- Living
- Entertainment
- Music
- Business
- Opinion
- Columnists
- Multimedia/Video
- Forums
- Travel
- Contact Newsroom
- TOWNS**
- Burlington
- Charlotte
- Colchester
- Essex
- Hinesburg
- Jericho
- Milton
- Shelburne
- S. Burlington
- Williston
- Winooski
- Franklin County
- NATION/WORLD**
- ARCHIVES**
- 
- Search from:
- 
- News Archive
- NewsWeek
- Sunday's Edition
- CLASSIFIEDS**
- Place an ad
- Careers
- Wheels
- Real Estate
- Apartments
- Shopping
- Dating
- Free Press Jobs
- ANNOUNCEMENTS**
- Obituaries
- Births
- Weddings
- Announcement Forms
- School Cancellations

**A thinking person's thinking robot**

Published: Friday, May 18, 2007  
 By Tim Johnson  
 Free Press Staff Writer

Chances are that, sooner or later, Josh Bongard will be popularly known for something other than his work on the four-legged robot that taught itself to walk and then, after it was partially disabled, to lurch.

For now, though, that flailing but resilient contraption -- which he and two collaborators at Cornell University dubbed "Starfish" -- remains something of a signature creation. It also happens to unsettle some people who watch it in action ("a little bit scary," the interviewer on the Discovery Channel called it), considering that this is a machine that seems to have a basic sense of self-awareness.

If the notion of a self-aware robot unnerves the general public, the transcendent nature of Bongard's research might have a similar effect on some of his academic colleagues who are bound to standard departmental disciplines. The University of Vermont hired Bongard as an assistant professor of computer science, but his work in robotics and artificial intelligence draws on biology, psychology, neuroscience, mathematics, economics, even philosophy. What does it mean to be self-aware, after all?

"You have a sense of your own body," Bongard said. That much seemed to be true of Starfish, whose creators assigned it the task of moving across a surface without telling it how to do so. Instead, the robot was programmed to test the locomotive possibilities for itself with a "series of playful actions" that Bongard compared to what a human infant engages in. The robot learns what its body can do and what it can't, ultimately teaching itself to walk, as Bongard describes it.

Then, when the researchers removed a part from a leg, rendering that leg useless, the robot went through another learning process and figured out another way to move -- a way its creators hadn't expected. Instead of hobbling on three legs, it essentially dragged itself along.

What's novel about Starfish is that it adapts to its own injury. What's novel about Bongard's work is that it overarches academic pigeonholes. He is co-author of "How the Body Shapes the Way We Think: A New View of Intelligence," newly published by The MIT Press, that spans biological, artificial and organizational intelligence, with multiple citations of scholarly luminaries in economics, mathematics, psychology and computer graphics.

Dean's approach  
 This sort of interdisciplinary exploration is in keeping with the "unity of knowledge" approach to engineering that Domenico Grasso has been promoting since he became dean of UVM's College of Engineering and Mathematical Sciences two



Copyright 2007 **THIS WEEK IN PHOTOS**

Josh Bongard, an assistant professor in the College of Engineering and Mathematics at the University of Vermont, shows some of the robotics components used in his classes on Wednesday.  
 ALISON REDLICH, Free Press

**STORYCHAT**

Be the first to comment on this article

ADVERTISEMENT

**Book by June 1**  
 Restrictions Apply

**50°F**  
 Cloudy  
 Forecast »  
 VIEW LIVE WEBCAM

**WEATHER**  
 SPONSORED BY **terries**

ONLINE MARKETPLACE

- careerbuilder** FIND A JOB  
FILL A JOB
- cars.com** FIND A CAR  
SELL A CAR
- HOMES** FIND A HOME
- apartments.com** RENTALS  
PLACE AN AD
- Classifieds** BUY STUFF  
SELL STUFF
- shopLocal** SHOPPING  
COUPONS
- e|Harmony** FIND A DATE

ADVERTISEMENT

Dear Burl  
 Fly from  
**\$49**  
 to New  
 \*Additional taxes,

DINING

**Related Headlines from the World-Wide Web...**

**SERVICES**

Contact Us  
 Subscriber Services  
 Customer Services  
 Email Headlines  
 Submit Feedback  
 Advertise  
 Ad Design Specs  
 PDA Version  
 Troubleshooting Tips

**SPECIAL SECTIONS**

years ago. In a world where Asia is turning out many more engineers than the United States, Grasso advocates overhauling the traditional engineering curriculum to develop "holistic" engineers -- students equipped not only with the quantitative reasoning skills but able to think critically in other disciplines in attempting solve problems that might require some knowledge of, for example, sociology or business as well as technical know-how.

Bongard, who came to UVM last fall, is a recruit who exemplifies this approach. In fact, Bongard said, the "unity of knowledge" approach was one of UVM's key attractions for him. In the 1990s, as an undergraduate at McMaster University, in Ontario, he decided he wanted to specialize in both biology and computer science -- but there were no universities in North America that offered that combined program. That led him to the two institutions where he could pursue those interests -- University of Sussex, in England, where he got a master's degree; and the University of Zurich, in Switzerland, where he earned his Ph.D.

"We are incredibly fortunate to have him here," Grasso said. "He's world-class -- he could be at any university in the country."

Microsoft gift

Another endorsement came in April when Bongard was named one of five New Faculty Fellows in a program sponsored by Microsoft that aims to stimulate creative research. The five chosen this year, from among 100 candidates, are all assistant professors at U.S. universities. Each receives an unrestricted cash gift of \$200,000.

Bongard's current research projects go beyond robotics.

A "Participants Needed" notice on his Web site reads: "I am looking for people interested in helping to explore the nature of aesthetic preference: how and why do people like one object more than another? If you are interested, please click and get involved in scientific discovery." His intent, he said, is to develop a computer program that can learn what an individual's preference is, and then, predict other preferences for that person.

In robotics, too, his interest is in machines that can learn, with bodies that can grow and develop -- machines that evolve. Much of the research work in this field is done in the form of computer simulations of robots, as distinct from actual robots. In either form, Bongard's robots are different from the industrial robots on assembly lines that simply do the same thing over and over. Bongard designs robots that figure out how to do the tasks they are assigned.

The practical value of a robot that can adapt to its surroundings is obvious in two exploratory situations in inhospitable places: at disaster sites and on other planets.

Consider the Beagle 2, an exploratory robot that was apparently deposited on Mars in 2003 but never heard from again. Is it possible that the Beagle 2 suffered some minor malfunction -- something analogous to a lame leg -- and was incapable of overcoming it? Nobody knows, but scientists at NASA and other space agencies have a keen interest, Bongard said, in developing robots that have some capacity for adaptation and self-awareness.

He acknowledges that the notion of conferring a machine with self-awareness -- a quality which some people consider exclusively human -- can be "controversial."

He distinguishes, though, between self-awareness and consciousness. Starfish had one characteristic but not the other, he believes.

To be conscious, he said, one must be aware of one's own self-awareness.

Could a conscious robot be built?

"It's theoretically possible," Bongard replied, "but I'm not sure of the practical value." Contact Tim Johnson at 660-1808 or [tjohnson@bfp.burlingtonfreepress.com](mailto:tjohnson@bfp.burlingtonfreepress.com).

Printer Friendly Version

E-mail this article to a friend

Latest headlines by topic:

- Science / Technology
  - Space
- News from the www powered by: Topix.net --

More from today's Top Stories section:

- ▶ St. Michaels College celebrates its 100th commencement
- ▶ A thinking person's thinking robot
- ▶ Douglas to veto energy bill

**Burlington Free Press INTERACTIVE TOOLS**

Printer Friendly Version

E-mail this article to a friend

Website Problems/Feedback

Contact Newsroom

Subscribe to the Free Press

News Week

The week in photos

RSS Feed

**RESTAURANTS**  
**IN THE**  
**SPOTLIGHT**

Browse a selection of restaurants in Burlington and the surrounding area!

**DOWNLOAD DELIGHT**

Click here to download the password protected photo.

**Classified Partners:** [Jobs: CareerBuilder.com](#) • [Cars: Cars.com](#) • [Apartments: Apartments.com](#) • [Shopping: ShopLocal.com](#)  
[Customer Service](#) • [Terms of Service](#) • [Privacy Policy](#) • [Send feedback about burlingtonfreepress.com](#) • [Subscribe Now](#) • [Jobs with us](#)  
Copyright ©2007 Burlingtonfreepress.com All rights reserved.  
Use of this site indicates your agreement to the [Terms of Service](#)  
(Terms updated October 7, 2005)

