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President Obama Honors UVM Robotics Scientist

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- **By Joshua E. Brown**

UVM roboticist Josh Bongard will go to Washington D.C. to meet President Obama and receive the government's highest award for young scientists. (Photo: Sally McCay)

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Josh Bongard's website

For his work to understand how to build better robots, Joshua Bongard, a researcher at the University of Vermont, has received the highest award given by the U.S. government to young scientists.

On Sept. 26, President Barack Obama announced Bongard as one of 94 winners of the Presidential Early Career Award for Scientists and Engineers; he will be honored at a White House ceremony in October.

Bongard is only the second researcher in UVM history to receive the PECASE award, which provides $500,000 in research funds over several years.

Inspired by evolution

Bongard's far-reaching work looks to nature for ideas. "The goal is to borrow ideas from neuroscience and evolution to help us build better and more intelligent robots," he says.

So far, scientists have had little success in building resilient machines that can continually perform behaviors that are fairly simple but require ongoing adaptation to changing conditions — like paving a road or cleaning up a toxic dump.

But Bongard is on a mission to make them.

"The prevailing approach to create such machines is to copy physiological and neurological systems observed in animals, and build them into robots," Bongard notes. "This raises the issue however of what, from among the infinitude of existing biological structures, should be copied."

Instead of guessing, Bongard has innovated systems in which computer programs copy the dynamics of biological evolution and replay them in a virtual space with numerous generations of synthetic creatures — something like a highly sophisticated video game.

The resulting algorithm yields ideas for robots that have optimized their neurological structures — and their behaviors and body plans — over many generations of being tested by virtual evolution, instead of human guesswork.

With these ideas in hand, Bongard and his students can then build actual robots in their workshop that are adaptable and capable of responding to novel challenges.

"My long-term goal is to give back to neuroscience and evolutionary biology, to give us a different tool to investigate: why does intelligence evolve?" Bongard says. "Under what conditions will intelligence evolve? Could we ever consider a machine to be intelligent, or is intelligence something limited to biological organisms?"

Presidential vision

Recognizing this kind of innovative work, the PECASE awards "embody the high priority the Obama Administration places on producing outstanding scientists and engineers to advance the Nation's goals, tackle grand challenges, and contribute to the American economy," the White House wrote in a press release.

In 1996, the National Science and Technology Council was commissioned by President Clinton to create a program that would support and honor outstanding scientists and engineers early in their research careers — from this council came the PECASE award.

Each year, more than a dozen federal departments and agencies nominate scientists and engineers whose early accomplishments "show the greatest promise for assuring America's preeminence in science and engineering and contributing to the awarding agencies' missions," the White House press office wrote.

"It is inspiring to see the innovative work being done by these scientists and engineers as they ramp up their careers — careers that I know will be not only personally rewarding but also invaluable to the Nation," President Obama said in the White House release. "That so many of them are also devoting time to mentoring and other forms of community service speaks volumes about their potential for leadership, not only as scientists but as model citizens."

An innovator

Bongard, an assistant professor of computer science in UVM's College of Engineering and Mathematical Sciences, was one of 21 nominees presented by the National Science Foundation for the most recent round of awards.

Bongard's research has received national and international attention, and has been featured in *Wired* magazine, the *Boston Globe*, The Voice of America, *Popular Science*, and many other outlets. He also received a fellowship from Microsoft Research in 2007 for research related to self-healing robots — one of five given nationwide. He was named by MIT as one of the world's top innovators under 35.

Bongard will travel to Washington, D,C., Oct. 13-14, to receive the award and will attend three ceremonies cumulating with a recognition ceremony at the White House with President Obama.

"This award allows me to continue with my basic scientific research, but it also allows me to create tools that draw many people into my research beyond my graduate students," Josh Bongard says. "Through this award, we're developing a web interface that will allow people to perform evolutionary robotics experiments without having a background in evolution or robotics."