

ENGINEERING

CORNELL

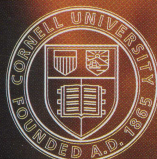
SPRING 2005

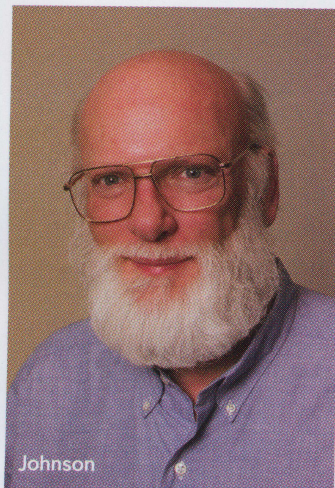
An engineer's guide to the brain
Expanding ideas for shrinking circuits
Home sweet solar home

Satellite Science

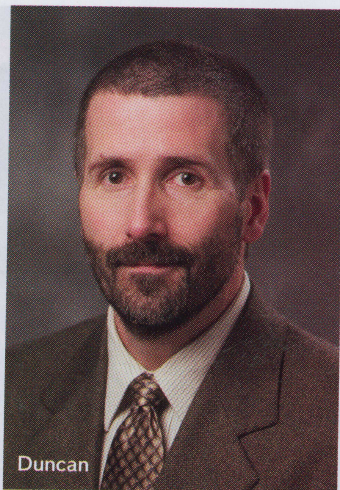
Designed by students and packed with technology, Cornell's
CubeSats are ready for orbit

Cornell University





Johnson



Duncan

penter Jr. Professor of International Studies, Department of Government.

The awards—\$5,000 for five years for each faculty member—are named for Stephen H. Weiss '57, emeritus chair of the Cornell Board of Trustees, who endowed the program. They recognize excellence in teaching, advising, and outstanding efforts toward instructional improvement and development.

“Most Cornell professors have a burning need to contribute something of lasting significance to their disciplines and a concomitant desire to share their intellectual passions with students,” said Cornell President Jeffrey Lehman. “I am delighted that, because of Steve Weiss’s vision and generosity, we have the opportunity each year to honor some of Cornell’s

most inspiring and effective undergraduate teachers as Weiss Presidential Fellows.” The faculty members were honored at an awards dinner in March.

Duncan, who joined the Cornell faculty in 1990 and has been the associate director of his school for the last ten years, is known for his keen interest in keeping material fresh and relevant to students while ensuring that it is grounded in scientific fundamentals of chemistry, physics, and math. For example, he devises demonstrations, exercises, and competitions for first-year engineering students to help them learn engineering design and creative problem solving. He is the recipient of numerous teaching awards and has been named a Merrill Presidential Scholar Mentor six times.

Johnson, who began teach-

ing at Cornell in 1981, has earned a reputation as a professor who not only serves as a leader in electrical and computer engineering but also as a mentor who gets involved with undergraduates and changes their lives for the better. He is considered a demanding, involved, and thorough teacher who challenges his students with significant design projects and who brings his research experience into the classroom. Johnson is the recipient of numerous teaching awards, including selection as the 1983 C. Holmes MacDonald Outstanding Teacher, a national award from the electrical engineering honorary society Eta Kappa Nu.

The Stephen H. Weiss Presidential Fellowships were established in 1992 by the Cornell Board of Trustees in recognition of the importance of undergraduate teaching.

—Susan S. Lang
Cornell News Service

THOSE A-MAZING ROBOTS

It’s a simple task, really: Program a robot to find its way through a maze. An electrical and computer engineering student could probably do it on a Saturday afternoon. But it’s not a mainstream study for mechanical engineering students, so Ephraim Garcia, associate professor of mechanical and aerospace engineering, has created a course called “mechatronics,” which teaches mechanical engineering students the basics of using electronics and programming to operate mechanical devices. Next year the course will be required for all students in mechanical engineering.

The final project in the course is to build and program small robots to find their way through a maze of simulated rocks strewn across a 12-foot-square course painted orange to suggest the landscape of

A course called “mechatronics,” teaches mechanical engineering students the basics of using electronics and programming to operate mechanical devices.



Shen Yuan Huang '06, Melissa Wrolstad '06, and Amy Orlansky '06 make adjustments to a robot during the competition.

Mars. The final test was held as a competition in the atrium of Duffield Hall on Dec. 3. About 115 students, working in teams of two or three, participated. A sizeable crowd, mostly other engineering students, gathered to watch the competition, cheering when a robot seemed to be heading for the finish box and groaning whenever one went in the wrong direction.

As with any engineering project, students found themselves making last-minute adjustments, dashing back to the lab, or tinkering with their robots on the floor of the atrium.

The robots, about six inches square, use infrared proximity sensors or tactile “feelers” or both. The control unit is a commercial Basic Stamp chip. An overhead camera provides a simulated GPS signal, telling the robots where they are in relation to the start and finish of the maze.

The basic maze-running algorithm is something like “Go toward the finish until you sense an obstacle, then back up, turn a little and go again.” But variations make all the difference. Garcia’s requirement was that a robot finish in five minutes or less, but the robot built by the winning team of Gabe Newell, Jackie Romero, and Frank Keller, all seniors, managed a phenomenal 25 seconds. Their secret: confidence. While most robots moved in short spurts, stopping frequently to check for obstacles, theirs charged ahead until it sensed something, then made a full 90-degree turn and took off again.

—Bill Steele
Cornell News Service

TEACHABLE MOMENT

If there ever were a teachable moment when it comes to tsunamis, physics, and fault lines, that moment happened in December. And Cornell graduate student Evan Variano made



Evan Variano, a graduate student in civil and environmental engineering, demonstrates a portable tsunami teaching device he helped build to an earth science class at Dryden High School Jan. 13. As part of his fellowship with the Cornell Scientific Inquiry Partnerships program, Variano put together a lesson on the physics of tsunamis, drawing on his studies of turbulence, that he shared with area high school classes.

sure it was not lost.

In the wake of the devastating Asian tsunami, he took a lesson plan he developed—and a portable teaching device—to high schools in the Ithaca and Rochester areas during January to answer students’ questions about the physics of tsunamis, the technology required to detect the killer waves, and the economics and sociology of developing early warning systems.

“I’m trying to cover whatever the students are curious about,” said Variano, a graduate student in Cornell’s School of Civil and Environmental Engineering. His mentor is tsunami expert Philip Liu, professor of civil and environmental engineering, who led a fact-gathering delegation of American scientists from the National Science Foundation’s Tsunami Research Group and the U.S. Geological Survey into wave-ravaged Sri Lanka.

Variano, whose specialty is turbulence, is a fellow in the Cornell Scientific Inquiry Partnerships (CSIP) program. The fellowship is a National Science Foundation-supported program that gives 10 Cornell graduate students free tuition and a stipend in exchange for about 15 hours a week teaching in area public schools.

He is teaching high school students studying earth science, environmental science, and biology how underwater earthquakes trigger the destructive waves. The teaching device, which Variano built with the help of Cornell technicians Paul Charles and Tim Brock, is a tube that allows students to experiment to see how a tsunami develops differently depending on what type of shoreline it hits.

“The wave drives through the deep ocean at 500 miles per hour, and without losing energy it builds up to 30 feet tall as it approaches shallower water and the shore,” explained Variano. “When it hits the coastline, it’s the turbulence—the mixing—that hits from all sides and holds people underneath the water. This causes most of the death and destruction.”

Variano also makes a point of discussing more than the science of waves and earthquakes with the high school students, because, he said, “Science doesn’t happen in a vacuum.” Observed Karen Taylor, an earth science teacher at Dryden High School, where Variano visited in January: “Many eyebrows were raised when Evan shared with them the cost of an early tsunami detection system in the Indian Ocean [about \$20 million] versus the amount of