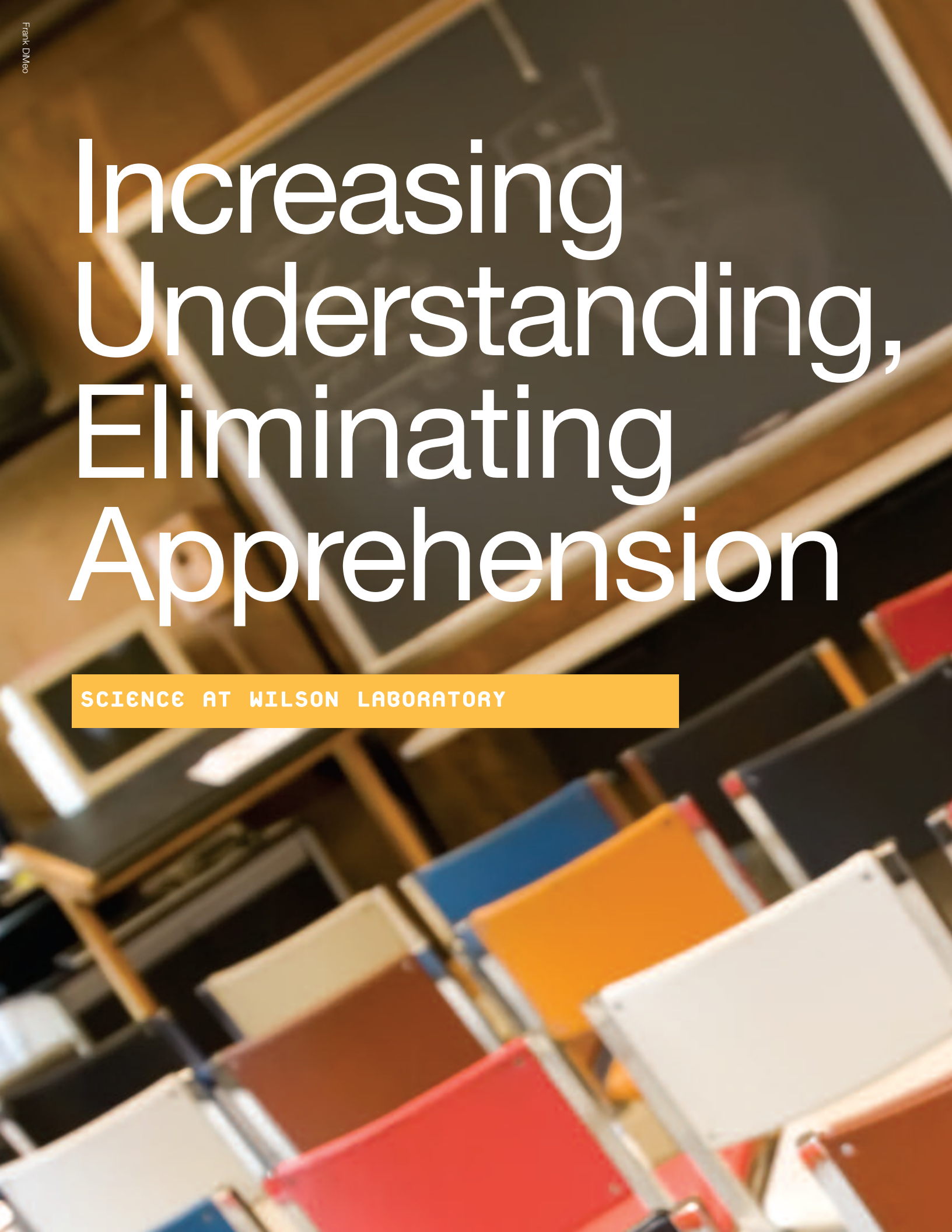


Frank DiMeo

Increasing Understanding, Eliminating Apprehension

SCIENCE AT WILSON LABORATORY

Robert Barker/CU

Robert Barker/CU

Cornell University not only has a reputation as a leading research institution, but the university has also demonstrated its commitment to science, mathematics, and engineering outreach and education. Wilson Lab embraces efforts that promote science literacy and a broader impact for research conducted at the facility. Outreach encompasses a wide range of activities that teach nonscientists about the approachability and excitement of science and technology at Wilson Lab.

The lab's organized outreach program creates age-appropriate educational activities for the general public, students in grades K–12, undergraduates, and science teachers. Wilson Lab aims to help people see and do science, thereby increasing their understanding of science and eliminating apprehensions. The Wilson Lab staff enjoys sharing their stories and perspectives on why and how scientists do their jobs.


Frank DiMeo

MOST FIND EXCITEMENT AMONG THE MILES OF TWISTED WIRE, PIPES, AND PLUMBING. CORNELL ALUMNI OFTEN MARVEL AT HOW LITTLE THEY KNEW ABOUT WHAT WENT ON BENEATH THE ATHLETIC FIELDS DURING THEIR UNDERGRADUATE YEARS.

More than 1,000 people visit the synchrotron tunnel, CLEO detector, and CHESS x-ray stations of Wilson Lab each year. These organized tours offer people of all ages—from ambitious elementary school students to alumni during Cornell alumni weekends to curious members of the general public—the opportunity to see this unusual scientific complex firsthand. Most find excitement among the miles of twisted wire, pipes, and plumbing. Cornell alumni often marvel at how little they knew about what went on beneath the athletic fields during their undergraduate years.

Wilson Lab's multifaceted approach to outreach entails a full-time outreach program coordinator, a trained science teacher, for LEPP. CHESS, G-line, and MacCHESS host organized educational events as well as devote resources to Cornell-wide outreach programs, particularly in conjunction with the Vice Provost for Outreach. This office, with a firm commitment to science outreach and education, provides an organizational infrastructure for the many campus-wide programs.

K–12 Educational Programs

Cornell University is setting an example for other research institutions by funding, developing, and sustaining innovative K–12 outreach programs. LEPP collaborates with many established departments to develop new resources for K–12 students and educators. Faculty, staff, and undergraduate students at LEPP and CHESS develop and deliver after-school enrichment programs for elementary and middle school students. The staffs work together to create materials that are exciting and educational.

Visits to area schools provide children with the opportunity to learn about science topics beyond those addressed in the adopted classroom curriculum. Presentations at local high schools give LEPP and CHESS staff the opportunity to share their knowledge and unique perspectives with an audience that might not ever walk onto a university campus.

Frank DiMeo

Lora Hine, Educational Outreach Coordinator, LEPP

Several recent educational programs have expanded Wilson Lab's outreach efforts to some of the neediest areas of New York. The lab's connections with New York City's public school children and involvement with many underfunded rural schools have dramatically increased contact with underrepresented students during the last few years. Wilson Lab provides physics and physical science education resources to these populations. Cornell's concerted outreach to disadvantaged populations is continually growing, thanks to a network of motivated educators and concerned citizens.

Robert Barker/CU

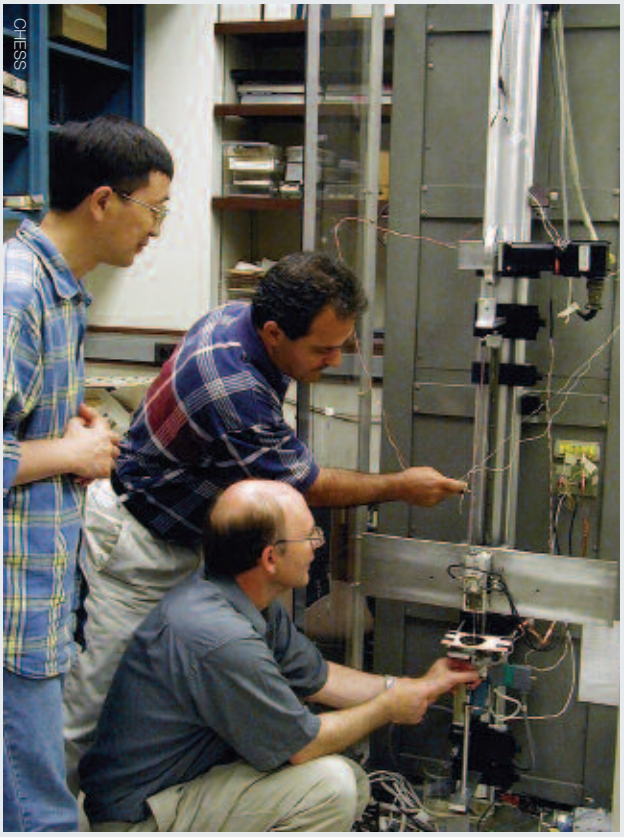
A LANSING HIGH SCHOOL SCIENCE TEACHER EXCLAIMED THAT THE CLOUD CHAMBER WORKSHOP WAS "SO COOL, BECAUSE I GOT TO SEE MUONS GO WHIPPING THROUGH THE CHAMBER, AND THEN REALIZE THEY ARE CONTINUING ON THROUGH ME!"

IN ADDITION TO LEARNING IMPORTANT DETAILS OF COMPUTING AND X-RAY DIFFRACTION, THE RET TEACHERS LEARN ABOUT LARGE-SCALE SCIENCE AT WILSON LAB, AND THEY GO HOME WITH STORIES TO TELL ABOUT RESEARCH OUTSIDE THEIR PRIMARY AREAS OF TRAINING.

The laboratory helps school administrators and teachers coordinate class visits to Cornell as part of students' field trip experiences. During the last year, approximately 350 middle and high school students participated in outreach programs, tours, and other Wilson Lab activities. Many students traveled for more than an hour to get to the laboratory.

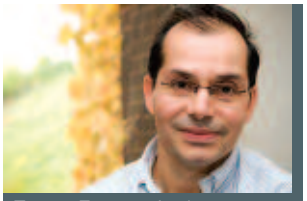
One hundred honors chemistry students from Ithaca High School spent a day at Cornell visiting the Johnson Museum and CHESS. They learned how chemistry and chemical testing are used in the real world. The students performed hands-on x-ray spectrometry measurements at CHESS to identify the origin of arrowheads and stones.

CHESS Outreach



CHESS

(c.) Massoud Assadi, RET teacher from Cody High School in Detroit work with CHESS researchers on a heating tower used to melt and draw hollow glass tubes to act as tapered capillary lenses for focusing x-ray beams to micron-sized probes.



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Ernest Fontes, Assistant Director, CHESS

Resources for Science Educators

The New York State Educational Department adopted a new physics core curriculum in 2002 requiring high school physics instructors to teach the standard model of fundamental particles and particle interactions in the modern physics unit. LEPP supplied educators with valuable resources for teaching this new and unfamiliar topic. Laboratory investigations, hands-on activities, and lecture materials for teaching the standard model have been demonstrated and distributed to over 500 high school science teachers during the last five years.

Representatives from Wilson Lab coordinated several professional development opportunities for K–12 educators. LEPP hosted workshops devoted to earth science and physical science curriculum development. As statewide physics test scores come under continued scrutiny, LEPP hosted two conferences devoted to exploring changes to the current high school science curriculum, particularly whether teaching conceptual physics in ninth grade is beneficial to young learners. The lab continues to be a resource for school administrators and teachers who are interested in implementing Physics First in their high schools.

LEPP participates in campus-wide Professional Development Day, organized by the associate provost for outreach. In March 2006, more than 1,400 central New York educators came to Cornell to sharpen their skills in pre-K–12 education. The Wilson Lab sponsored workshops on topics ranging from electricity and magnetism to light and optics. A Lansing High School science teacher exclaimed that the cloud chamber workshop was "so cool, because I got to see muons go whipping through the chamber, and then realize they are continuing on through me!"

Undergraduates and NSF's Programs for Research Experiences

The National Science Foundation (NSF) targets funds for research experiences for high school teachers and undergraduates from areas that are predominantly minority or underrepresented in science fields. Wilson Lab staff has served as mentors to undergraduates and teachers through collaboration with Wayne State University (Detroit) in the NSF's Research Experience for Undergraduates (REU) program. Many of the staff will testify that summer visitors not only add an element of fun to the lab, but also help focus staff efforts and propel projects to completion!

The RET (Research Experiences for Teachers) program is especially admired, because science teachers who become knowledgeable about scientific research are in the best position to motivate and convey the excitement and benefits of careers in science to their students. These teachers work hard. An example of one project involved a teacher collaborating with CHESS staff to build a tool to measure strain in crystals used for x-ray optics manufacturing. Her work helped to discover which steps during the processing most often introduced strain into crystals. This project altered the standard procedures, so that cut and brazed crystals were virtually indistinguishable from the virgin materials. In addition to learning important details of computing and x-ray diffraction, the RET teachers learn about large-scale science at Wilson Lab, and they go home with stories to tell about research outside their primary areas of training.

LEPP

Wesley Pitts (center) and students from New York City's "EXPLORE!/Queens Bridge to Medicine Program" take a tour of the particle detector and accelerator during a recent trip to Cornell University.

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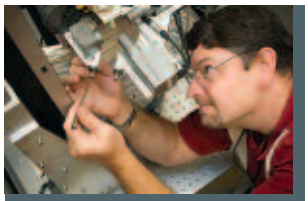

Robert Santavicca, a chemistry and physics teacher at the Murray Wright High School in Detroit, Michigan

Community Events

In June of 2005, a special Wilson Lab open house was organized as part of the ongoing effort to encourage the public to tour the lab and learn about its fascinating science. As announced to the public during the opening remarks, the science at the lab depends critically on the formula $E = mc^2$. The recognition of Einstein's contributions to research conducted at Wilson Lab tied the celebration of the World Year of Physics 2005 to the festivities held at the open house. During the weeks before the event, the staff created posters that explained some of the science done at the lab. The posters were displayed at the Tompkins County Public Library, which offered accompanying public lectures on high energy physics. The laboratory was open to visitors for over four hours during the Saturday open house, and over 600 attendees walked the hallways and were entertained and educated by Wilson staff members. Staff volunteers working at stations throughout the facility hosted a variety of demonstrations and hands-on activities. Guided tours of the LEPP and CHESS research facilities were conducted on a continual basis. The open house was a huge success, and Wilson Lab is excited about planning future events that invite the public to explore and engage in the fascinating world of particle physics.

Lora K. Hine, Educational Outreach Coordinator, LEPP
Ernest Fontes, Assistant Director, CHESS

Science Really Is "Cool"!
"I have been involved in the outreach effort at LEPP for a year and a half now, primarily organizing after-school activities for local elementary and middle schools. It has certainly been a great pleasure working with the kids and exploring science. It's especially rewarding when the kids are amazed with the activities and exclaim, "Cool!" In the process, I have had to rethink many of the basic concepts in physics that I have not thought about in a long time or have never thought about at all. I am also constantly reminded of why I wanted to study science in the first place: because science really is cool!" - Hiro Miyake '06

LEPP

Hiro Miyake, Cornell undergraduate and president of the Society for Physics Students, works with students at Boynton Middle School explaining how the path of light is bent when traveling through different materials. With Miyake as president and Nabil Iqbal as outreach coordinator of Cornell's Society for Physics Students, the group was awarded the prestigious 2006 Blake-Lilly Prize for positively influencing school children and the general public about physics.

For more information:

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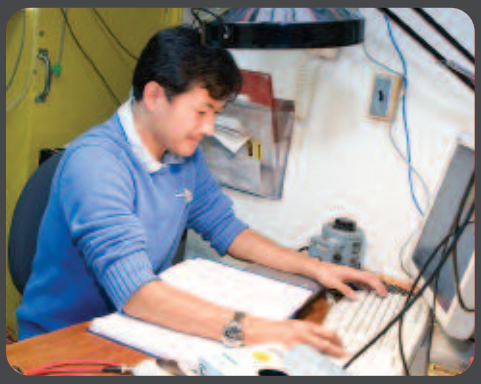
Ernest Fontes: ef11@cornell.edu

TOURING WILSON LABORATORY



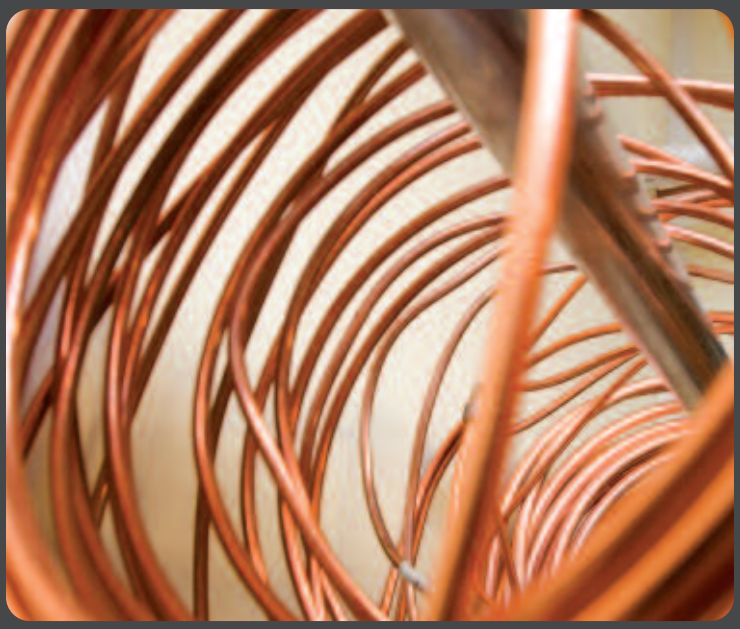
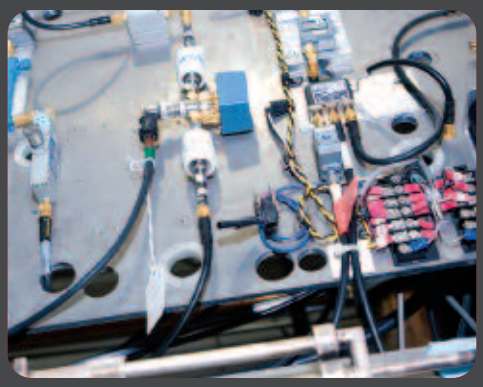
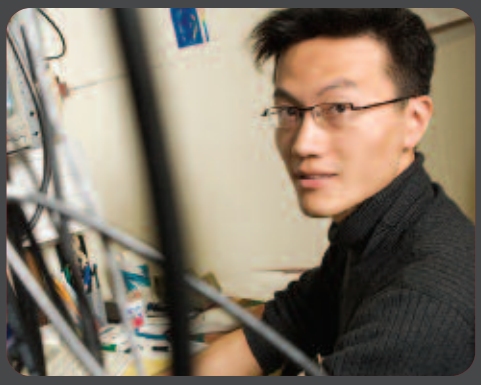
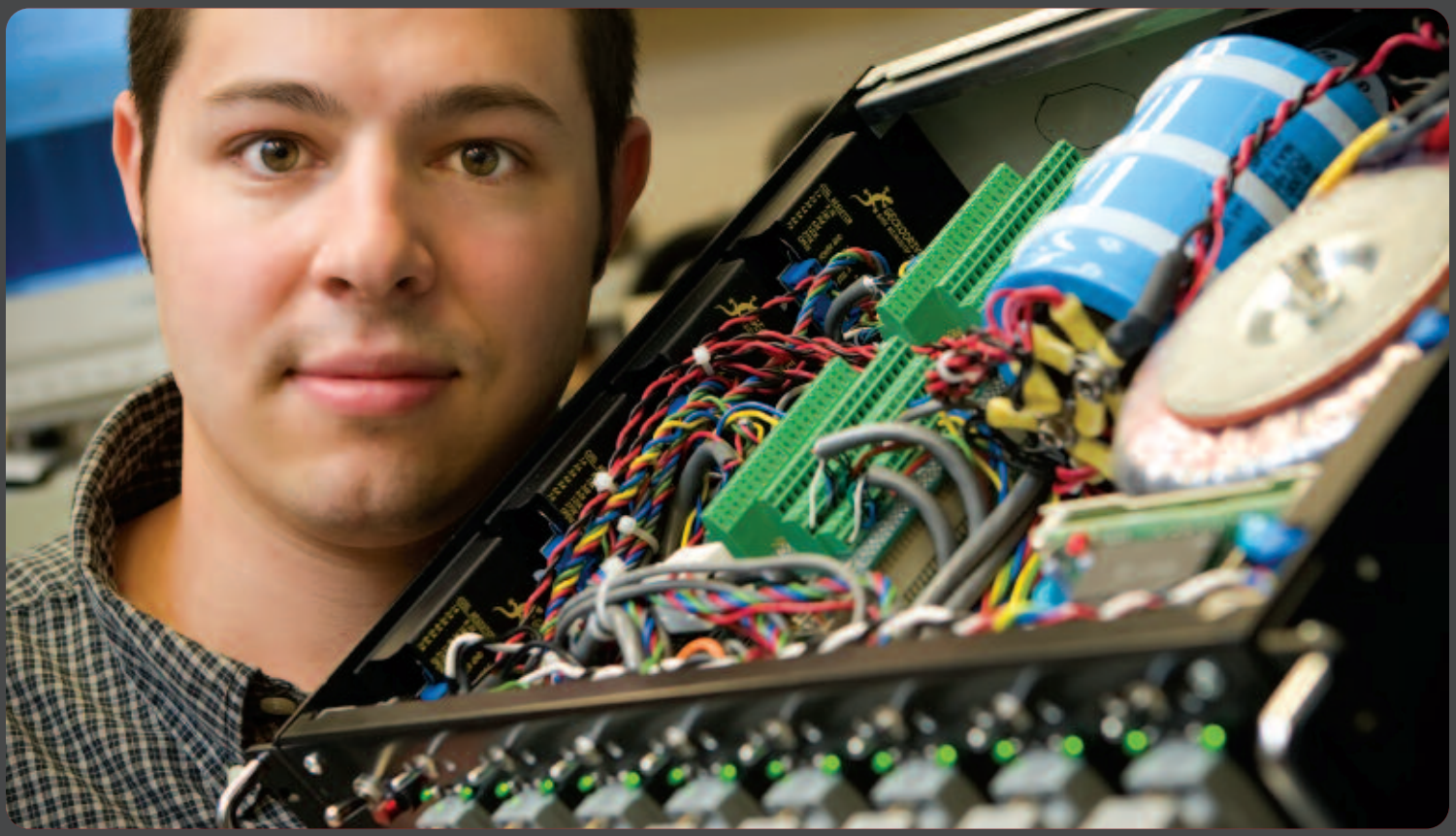


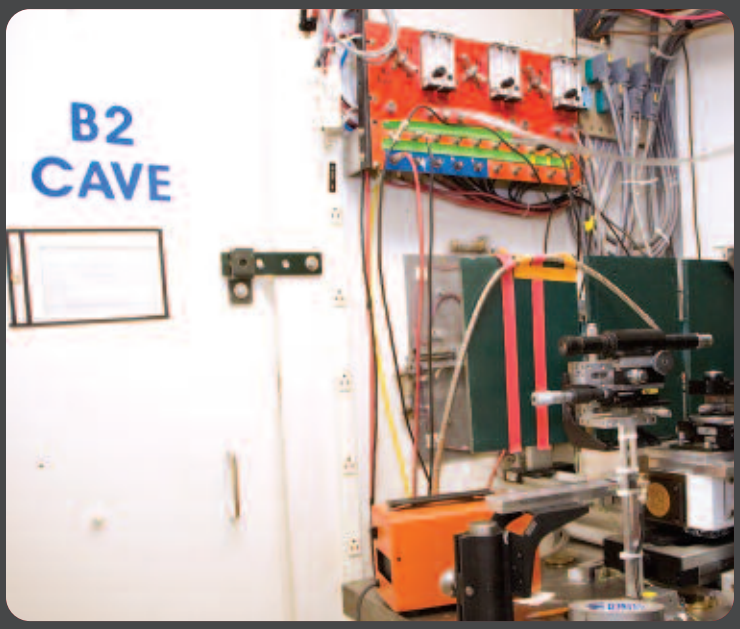
Photo credits: Frank DiMeo





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