



# Electrical & Computer ENGINEERING News

## Another Accolade for Fort Collins

*Forbes* magazine recently ranked Fort Collins as “the third best place for business and careers.” Among the criteria that boosted the area were its educated work force (40 percent of area residents have a bachelor’s degree, which ranks sixth in the nation), strong income growth, and business costs below other locales. In the last two years, Fort Collins has received national attention from widely known publications such as *Outside Magazine*, *Kiplinger’s Personal Finance*, and *Money Magazine* for being a great place to live and work. The recognition serves as a selling point for Colorado State University in recruiting top students and faculty from around the country.

**Colorado  
State  
University**

## Colorado’s Premier Research Universities Form Collaboratory



In February 2007, the Colorado Renewable Energy Collaboratory Agreement was signed, creating a collaboration to develop new energy technologies. The Collaboratory is a partnership among Colorado State University, the University of Colorado at Boulder, the Colorado School of Mines, and the National Renewable Energy Laboratory.

The four institutions will share human resources, funding, and facilities to conduct renewable energy research and development projects through the Collaboratory. Supporters say the agreement means Colorado is positioned to become the renewable energy capital of the world.

Working with public agencies, private enterprise, nonprofit institutions, and all of Colorado’s universities and colleges, the goal of the Collaboratory is the development of new technologies and the advancement of existing technologies for rapid transfer to private industry for commercial development. The Collaboratory will receive up to \$2 million

per year from the state of Colorado for use as matching funds to attract research grants and contracts from federal and private sources.

The ECE department will play a major role in the Collaboratory, utilizing its expertise in controls to manage and maximize efficiency of wind turbines and “smart” grid technology.

## CSU is Second in the Nation for Recycling

Colorado State University placed second in the nation in the Grand Champion competition for RecycleMania, a 10-week recycling competition among colleges and universities across the nation.

CSU finished with a cumulative recycling rate of 51 percent of the total waste generated on campus, up from 41 percent last year. CSU also finished fifth in the country in the Waste Minimization category and was first in the state

*continued on Page 3*

## Student Spotlight: Top Undergraduate Student Inspired by ‘HP Way’

Ranking 97th out of nearly 1 million participants in the Iranian National Universities Entrance Exam, ECE senior Mehdi Mehrpartou had a world of opportunities ahead of him. Born and raised in Tehran, Iran, Mehdi was inspired to study abroad and pursue his degree in electrical engineering at Colorado State University after reading David Packard’s book, *The HP Way: How Bill Hewlett and I Built Our Company*.

“I am absolutely enthusiastic about what David Packard and Bill Hewlett have achieved since 1939, starting out with only \$500 in a garage in Palo Alto, Calif.,” Mehdi said. “Among all the places I visited in America, Fort Collins stood out. The beautiful town is home to both a highly reputable university and a Hewlett-Packard site.” He continued, “I knew I could pursue my electrical engineering degree while

seeking an internship with my dream company.”

Both ventures have proved successful for Mehdi. He currently balances a part-time internship with HP, while maintaining one of the highest GPAs in the ECE department. Mehdi is a model student for ECE undergraduates, serving as one of the first mentors in the new ECE Peer Mentoring Program. He also was selected to take part in the President’s Leadership Program at Colorado State, a comprehensive leadership development experience consisting of three yearlong academic and experiential courses designed to meaningfully explore various aspects of leadership.

“My experience with the ECE department has been amazing and life-changing,” said Mehdi. “I enjoy going to classes with students who care about each other and are passionate about learning.” He concluded, “It is very inspiring



*ECE senior Mehdi Mehrpartou*

and motivates me to work harder every day.”

Mehdi’s talent, commitment, leadership, and community involvement continue to pay off and allow him to pursue his dreams. Following graduation in May, he will begin his career with HP in Fort Collins, where he will work as an R&D hardware design engineer. Mehdi also

plans to pursue a master’s degree in either electrical or biomedical engineering or a business discipline.

When he’s not studying or working, Mehdi enjoys reading about philosophy of science, philosophy of religion, and Persian literature and poetry. He also enjoys exploring topics surrounding social justice and diversity.

## Recruitment Activities Draw Prospective Students to CSU

This spring, the ECE department continued its emphasis on recruitment with special events and one-on-one activities designed to attract students to Colorado State University.

Engineering Exploration Day, a biannual event for high school students, their parents, and community members, was held in February, drawing more than 500 for a record turnout. To help participants understand the depth and breadth of the field, the event included senior design project presentations and a department overview featuring the benefits of a degree in ECE and examples of career opportunities. For graduate students, the department hosted an all-day informational event in March for top students across the country. These initiatives, along with personal visits, representation at conferences, and targeted regional events, have allowed the department to identify and attract high-ability students for its undergraduate and graduate programs.

“Given today’s competitive recruiting environment and the nationwide drop in enrollment in ECE, I believe it is imperative that we continue to increase our efforts to recruit the best and brightest students,” said Karen Ungerer, ECE recruitment coordinator. “There are many attractive reasons

to pursue a degree in electrical or computer engineering at CSU, and we are doing our best to promote these benefits to prospective students.”

The market continues to bode well for students majoring in electrical or computer engineering. ECE graduates consistently earn higher starting salaries than most disciplines, and electrical and computer engineering again ranked among the top 10 majors in demand for bachelor’s, master’s, and doctoral degrees, according to the “2008 Job Outlook Report” from the National Association of Colleges and Employers.

If you know a talented student who is considering a degree in engineering, we encourage you to contact the ECE department. We are pleased to provide students with additional information and to help arrange personal campus visits. For more information, please contact Karen Ungerer at (970) 491-0500 or [kungerer@engr.colostate.edu](mailto:kungerer@engr.colostate.edu).

This newsletter is produced twice yearly by the Department of Electrical and Computer Engineering. Please send story ideas and comments to:

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## Eads Family Establishes Scholarship for ECE Students

As an ECE adjunct faculty member, Dr. Bill Eads understands firsthand the financial challenges that some electrical and computer engineering students face. That is why Dr. Eads and his wife, Marcia, decided to establish the Eads Family Scholarship.

“Over the past several years, I have seen plenty of students struggle financially while taking a full course load and working many hours,” said Dr. Eads. “It really makes it difficult for them to focus their attention on learning difficult material.” He added, “Marcia and I believe that one of the most effective uses of our charitable contributions is to help alleviate the financial burden for serious students who really need the assistance.”

The Eads Family Scholarship will support one electrical or computer engineering freshman per year for the next four years, beginning this fall.

The scholarship recipients must have a high school GPA of 3.2 or better and demonstrate financial need. Each scholarship is renewable, provided the selection criteria continue to be met.

Dr. Eads, who joined the ECE department in 2002 after a longstanding career with Hewlett-Packard, enjoys sharing his enthusiasm for engineering and real-world experiences to help students learn complex concepts. Mrs. Eads also shares a passion for education, having served for 20 years as an elementary school teacher in Loveland, Colo. Dr. and Mrs. Eads have three children, all of whom received college degrees.

Dr. Eads noted, “We would like to encourage others who have enjoyed successful careers as a result of their engineering education to also support future generations of students, whether



Scholarship donors Marcia and Bill Eads

by teaching or by giving scholarships or scholarship endowments. We believe it is one of the best ways to help ensure successful engineering careers for years to come.”

### RamTracks Provides a Closer Look at Colorado State

Last fall, Colorado State University launched RamTracks, a visitor tour series designed to showcase the University's academic, cultural, and institutional treasures. The program is sponsored and coordinated by the Office of the President in conjunction with CSU's academic colleges and departments. With RamTracks, participants get an up-close and personal look at Colorado State, visiting with faculty and students, learning about CSU's most exciting research and programs, and participating in behind-the-scenes tours of campus labs, classrooms, and facilities.

RamTracks tours are free and open to the public and can be customized for organizations and groups upon request. Tours are limited to no more than 12 people and are offered on a first-come, first-served basis. For more information, contact Stacy Dotson, RamTracks coordinator, at (970) 491-3858.

### Recycling *continued from Page 1*

among the four Colorado universities participating in the Whole Campus division of the competition.

RecycleMania is a 10-week recycling competition with 400 colleges and universities competing against each institution's recycling program. A total of 58.6 million pounds of material was recycled by all schools involved in the competition. During the 10 weeks, CSU recycled 451,872 pounds of material.

To learn more about the RecycleMania competition, visit [www.recyclemania.org](http://www.recyclemania.org).

## Engineering Career and Internship Fair Becomes Two-Day Event

This year's College of Engineering Career and Internship Fair grew to a two-day event in order to accommodate more employers seeking students majoring in the STEM (science, technology, engineering, and math) disciplines. The fair, which was held on February 13 and 14, attracted more than 1,000 students, surpassing record attendance set in 2007.

Students of all class levels attended the event to explore full-time positions and internship opportunities with leading companies around the country. The fair created a venue for students to learn about various industries and career paths, while company representatives were able to visit with promising candidates and schedule follow-up interviews.

Watch the College of Engineering web site ([www.engr.colostate.edu](http://www.engr.colostate.edu)) for details about the spring 2009 Engineering Career and Internship Fair, or contact John Haines at (970) 491-0716 or [john.haines@colostate.edu](mailto:john.haines@colostate.edu) for more information.



## ECE Students Open the Door to Effortless Wheelchair Access

Addressing issues affecting the wheelchair-using community, ECE senior design students are making wheelchair access effortless, one door at a time. Students Jon Kay, Garet Scranton, and Jason Hall, under the direction of Olivera Notaros, head of senior design, are developing technology to integrate with current handicapped door systems to give wheelchair-users greater freedom of access. The project idea, which was spawned in 2006 with ECE alumnus Justin Moninger, has progressed in the last two years.

The team has designed an electronic transmission system for wheelchairs and receiving doors. Equipped with a pulsing circuit, the mobile device has a transmitter that communicates with receiving doors within range, allowing them to open upon approach. Currently, wheelchair-users must push a button to open doors, which is limiting to individuals who are without the use of their fingers, biceps, or triceps. An innovative system, this touchless design works in conjunction with standard wheelchair access button entries, providing greater independence to those with limited mobility.

This semester, the team is concentrating on adding an accelerometer circuit to the device for motion sensing. This will allow



*ECE students worked with CSU Facilities to install an electronic transmission system in campus doors to improve wheelchair access. From left to right: Patrick Johnson, CSU facilities coordinator, and ECE students Jon Kay, Garet Scranton, and Jason Hall.*

the device to remain off or inactive until wheelchair acceleration is detected. Future plans involve advancing the functionality of the product to include direction detection and security.

Beyond learning the research and design behind new technology development, the senior design team plans to work with the Colorado State University Entrepreneurship

Club, part of the College of Business Entrepreneurship Center, to create a business and marketing plan for their innovative prototype. In addition, students will work in partnership with wheelchair-users on product development, while developing multidisciplinary relationships and teamwork skills.

## Senior Design Project Helps Teach Animal Acupuncture

This spring, an ECE senior design team captured the attention of the national and international media for its work on SimPooch, a virtual canine head designed to help teach veterinary students how to perfect the practice of acupuncture on a dog. The project, a collaborative effort with the College of Veterinary Medicine and Biomedical Sciences, has been publicized through media outlets in Colorado and around the world.

“It’s great for our department to receive this level of recognition,” said Olivera Notaros, head of the ECE senior design program. “Our students are involved in many exciting projects that allow them to explore unique ways to use electrical and computer engineering concepts to improve society. The SimPooch project is a perfect example of this kind of cross-disciplinary interaction.”

SimPooch is an ongoing project that will span multiple years. It started in 2006 with mechanical engineering students and Sue James, director of the School of Biomedical Engineering in CSU’s College of Engineering. They built a physical model of a dog’s head that mimics the feel of inserting needles through bone, muscle, skin, and fat.

Now, under the direction of project adviser Dr. Peter Young, ECE students Brendan Dahl, Bryan Landwehr, and Sean Thomas are working to build computer software that will reproduce the head in a virtual reality environment and also interface with the physical model. This will inform acupuncture students about the accuracy and precision of students’ acupuncture point location techniques. The SimPooch project is built around a “haptic interface,” essentially a small robot that functions as a 3D mouse. This allows for accurate manipulation and



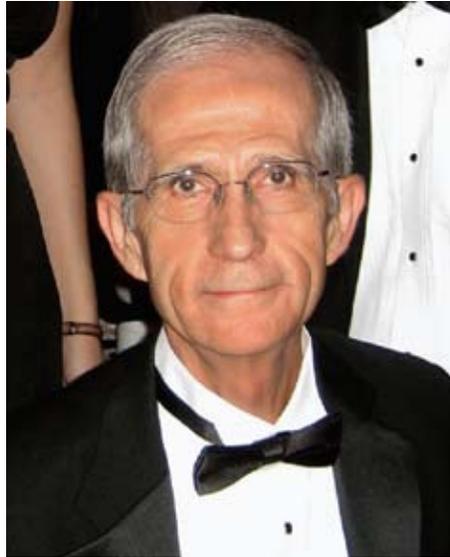
measurement of the virtual acupuncture needle. Future work on the project will seek to utilize force feedback via this device to also add realistic feeling to the process, further enhancing the training capabilities of SimPooch. To learn more, visit the project website at [www.engr.colostate.edu/ece-sr-design/AY07/SimPooch/index.htm](http://www.engr.colostate.edu/ece-sr-design/AY07/SimPooch/index.htm).

## Chris Christopher Named 2008 ECE Distinguished Alumnus

The ECE department recently selected Chris Christopher to receive the 2008 Distinguished Alumni Award. Chris, who earned both his bachelor's and master's degrees in electrical engineering from Colorado State in 1968 and 1974, respectively, was honored at the College of Engineering's annual Distinguished Alumni Awards Dinner on April 19.

Chris has enjoyed a successful, longstanding career with Hewlett-Packard. Since joining the company in 1968 as a research and development engineer, he has served in various management and executive leadership roles in research and development, manufacturing, engineering computer development, desktop computer software, operating systems, languages, and graphics. Chris currently is the senior vice president and general manager of the Personal Systems Group Desktop Organization, which includes global business units for business PCs, consumer PCs, workstations, and displays. In this capacity, he is responsible for long-term strategy, product development, product marketing, supply chain, and total customer experience.

Chris currently resides in Loveland, Colo. He was born in Greece, where he received his high school education before moving to the United States. In addition to his degrees from Colorado State, Chris completed the Insead Executive Management Program in 1996. He serves on the Board of Directors of SMS Technologies. In his free time, Chris enjoys reading, fishing, and hiking.



## Can You Identify These Alumni?

Do you recognize the former electrical engineering students featured here? Let us know by calling (970) 491-1033 or sending an e-mail to [ece@engr.colostate.edu](mailto:ece@engr.colostate.edu).



It was 1962, the year the Cuban Missile Crisis began. Telstar, the world's first active communications satellite, was launched by the United States. Johnny Carson debuted as host of *The Tonight Show*, and Walter Cronkite was named anchorman for *CBS Evening News*.

Watch for an update in the next ECE newsletter.

### Update

The student featured below has not yet been identified. The photograph was taken in 1940. Contact the ECE department if you can name the alumnus.



## Class Notes

Please send your professional and family updates to [ece@engr.colostate.edu](mailto:ece@engr.colostate.edu). Your news will be published in the next ECE newsletter.

**James D. Brower (BSEE '60)** worked on surface-to-air missile systems for the United States Army for 30 years. He then retired and moved to private industry, where he worked for an additional 15 years. Brower is now fully retired and doing volunteer work. He has three children and six grandchildren.

**Larry Ellis (BSEE '81)** is the software manager for the Mars Phoenix Lander mission for Lockheed Martin and NASA's Jet Propulsion Laboratory. Landing day on the planet was May 25, 2008. Ellis has worked for Lockheed Martin for 22 years. His oldest daughter, Samantha, graduated with a degree in biology from Colorado State in 2007, and his youngest daughter, Stephanie, graduated this May from Colorado State's computer science department. She has a job waiting for her at Hewlett-Packard in Fort Collins.

**Tony Eimen (BSEE '92)** currently works as a senior design engineer and field engineer for Taos County, N.M. He has been married 12 years and has three children. In his free time, Eimen enjoys his classic vehicles: a 1968 Corvette and Firebird and a 1952 GMC three-quarter-ton pickup truck. He still has the little Shelby Charger he drove in college, but it is currently in storage.

**Cari Schnepf (BSEE '96)** and her husband, Eric, are proud parents of their second child, Cassidy Rose, who was born on April 1. She is welcomed by her older sister, Bella Luna.

**Younes Ben Brahim (BSEE '05)** is a customer support engineer at Alcatel-Lucent, Morocco.

## Alumnus Helps Ensure Top-Notch Education for ECE Students

ECE alumnus Frank Gray (BSEE '39), and his wife, Hazel, plan to will a portion of their estate to the College of Engineering and the Department of Electrical and Computer Engineering. These funds will help support future students and build on Colorado State's longstanding tradition of engineering excellence.

"By giving, we know that the future of CSU will be even better than what the school has been in the past," Gray said. "Even so, it will be hard to match today's high standards set by CSU."

Gray was a student in the mid-1930s, when the Colorado College of Agriculture and Mechanic Arts – the predecessor to Colorado State University – had 2,000 students who fondly referred to their school as "Cow College." He said that room and board was \$1 a day, four years of tuition came to nearly \$2,000, and enrollment was so small, the faculty-to-student ratio seemed like one-to-one.

In 1941, Gray interviewed for a position with the Electro-Motive Division of General Motors, producer of the diesel-electric locomotive that was replacing most of the world's steam locomotives. When asked if he had a degree in electrical engineering, Gray said "yes" – a response that led to a long and fruitful career.

"I've never forgotten that moment when my electrical engineering degree meant so much," he said.

During World War II, Gray served in the U.S. Army Signal Corps. He later returned to GM, where he became a senior electrical engineer in the Electro-Motive plant engineering department.

Upon retiring in 1973, Frank and Hazel moved to Arizona, where they reside today.

## ECE Alumna Engineers Northern Colorado's Favorite Ready-to-Serve Margarita

Marketed as "the microbrew of margaritas," ECE alumna Maureen Schaffer and her business partner, Randy Zwetzig, have teamed up to create a custom-blended concoction that is flying off the shelves in Northern Colorado. The duo endured two years of battling government regulations and paperwork to launch a bottled margarita called Coyote Gold, a product of their company, Rest and Relaxation LLC.

Schaffer and Zwetzig, both electrical engineers, worked together at a microelectronics company, where they met in 1985. After discovering a common passion for margaritas, they created a recipe that their friends and spouses encouraged them to market. Because they wanted their customers to experience the exact taste of their homemade margarita, Schaffer and Zwetzig went through 32 iterations with their manufacturer before reaching the right blend.

"We took a scientific approach and asked a lot of questions of our manufacturers that I don't believe they were expecting," said Schaffer. "As engineers, you consider the whole process in creating a quality product. We wanted to know about the controls and processes, and we really took the time to learn about the production ingredients." She added, "No one else in the industry had done this, and that is why I think our product is so good."



Randy Zwetzig and ECE alumna Maureen Schaffer pose with the first bottle of Coyote Gold off the production line.

Unlike some margaritas on the market that substitute neutral grain spirits for the liquor and use powders for flavoring, Coyote Gold is made with tequila and real ingredients. Manufacturers told them they wouldn't make any money using expensive tequila and triple sec, but Coyote Gold, which hit the market in January, is making a splash in Northern Colorado. The first production run of more than 2,000 bottles sold out at the distributor level in less than three weeks.

Schaffer earned her master's and doctoral degrees in electrical engineering from Colorado State University in 1995 and 1998, respectively. For more information about Coyote Gold visit [www.coyotegold.com](http://www.coyotegold.com).

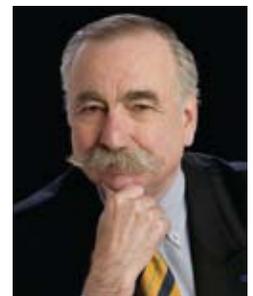
## Alumnus Tom Williams Honored by Chinese Academy of Sciences

Distinguished ECE alumnus Thomas W. Williams (EE Ph.D. '71), has added another outstanding achievement to his already impressive list of accomplishments.

Williams recently was named a member of the Chinese Academy of Sciences (CAS) for his technical contributions to science and engineering. Williams received the honor last fall while delivering a keynote speech in Beijing, China.

CAS is a leading academic institution and comprehensive research and development center in natural science, technological science, and high-tech innovation in China. CAS strives to be a scientific research base for fostering advanced science and technology talents and for promoting the development of China's new technology industries.

Williams is a Fellow at Synopsys, Inc., and serves as an adjunct professor at the University of Calgary in Alberta, Canada. Prior to joining Synopsys in 1998, Williams was manager of the VLSI Design for Testability group at the IBM Microelectronics Division in Boulder. He received a bachelor's degree in electrical engineering from Clarkson University, a master's in pure mathematics from the State University of New York at Binghamton, and a Ph.D. in electrical engineering from Colorado State University.



## EUV ERC Named Program of Research and Scholarly Excellence

Colorado State University Provost and Senior Executive Vice President Tony Frank recently announced that the University has selected its Programs of Research and Scholarly Excellence (PRSE) for the next four years. The Engineering Research Center for Extreme Ultraviolet Science and Technology, led by Professors Jorge Rocca and Carmen Menoni, was recognized as one of the top programs on campus.

The Programs of Research and Scholarly Excellence at Colorado State University were initiated in 1991 to recognize those areas within the University that have achieved great distinction and set a standard for excellence. Programs are selected after an extensive nomination and review process that takes place every four years. For a complete listing of PRSE programs visit [vpr.colostate.edu/pages/prse.asp](http://vpr.colostate.edu/pages/prse.asp).

## Chandra Named Associate Dean for International Research

ECE Professor V. (Chandra) Chandrasekar recently was appointed associate dean for international research. In this temporary assignment, Chandra is responsible for coordinating international initiatives within the College of Engineering, specifically those activities that focus on relationships with international institutions, international research, international faculty exchanges, and graduate student exchanges.

"This position is a perfect fit for Chandra," said Tony Maciejewski, ECE department head. "He has worked hard during his tenure at Colorado State to establish relationships with colleagues all over the world. I believe he has the right background and experience to grow our international outreach initiatives."

In this new role, Chandra serves as a liaison between the College of Engineering and the CSU Office of International Programs, develops financial support for



international initiatives, creates opportunities for increased numbers of international faculty exchanges, and coordinates all memoranda of understanding with international institutions.

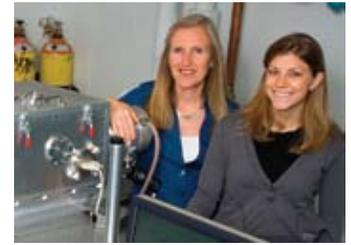
Chandra also will continue serving in his capacity as a professor in the Department of Electrical and Computer Engineering, where he is the deputy director of the National Science Foundation Engineering Research Center for Collaborative Adaptive Sensing of the Atmosphere.

## Menoni Leads \$2.5 Million Project

The Office of Naval Research recently awarded ECE Professor Carmen Menoni and her academic partners at the University of New Mexico, Stanford University, and Jefferson Lab a five-year, \$2.5 million Multidisciplinary Research Initiative grant to advance the fundamental understanding and development of interference coatings for high energy lasers.

Dr. Menoni is the principal investigator on the project, which will seek to develop robust optical coatings for the high average power Free Electron Laser demonstrated at Jefferson Lab in Virginia.

"In a laser, the mirrors that make up the cavity control the laser output power, so advances in the fabrication technology are imperative," Menoni said. "This research is critical for continued improvements in laser



*Professor Carmen Menoni and graduate student Courtney Brewer at the Engineering Research Center for Extreme Ultraviolet Science and Technology.*

technology, from high-power to ultrashort-pulse lasers. This is a billion-dollar industry."

Menoni's research program will provide unique opportunities for the training of graduate and undergraduate students. The impact of developing human resources with expertise in areas of technology of interest to the nation's economy is significant. Colorado, in particular, is a hub for a large number of industries specializing in optics and more specifically in optical coatings.

## College Launches Innovative Professional Learning Institute

In Fall 2007, the Professional Learning Institute (PLI), a student program unique to the College of Engineering, was launched. This program is designed to cover aspects of a professional engineering career that are typically not covered in engineering curricula.

Students participate in interactive workshops offered each semester and led by industry leaders and CSU faculty and staff. With course work and the PLI content, the college strives to educate well-rounded engineers who apply technical knowledge in order to identify and solve engineering problems; collaborate well in diverse teams; provide sound leadership; work creatively to provide innovative engineering solutions; use engineering skills to create positive global, economic, environmental, and social change; and understand their ethical responsibility and act with integrity. These graduates enter their first job with a great deal of practical experience and confidence.

Developed in response to employer feedback nationwide, the program's goal is to create engineering graduates capable of competing in a global workforce. Alma Rosales, executive on loan from IBM, spearheaded the program. With her help and connections, the college has been fortunate to offer sessions led by distinguished professionals from around the country. Rosales also is a member of the ECE Industrial Advisory Board.

If you would like to make a difference through the PLI, contact Alma Rosales at (970) 491-7088 or [alma.rosales@colostate.edu](mailto:alma.rosales@colostate.edu).

## CSU Hosts One of the World's Most Advanced Weather Radars

Colorado State University this spring installed a unique new antenna on one of the nation's most advanced polarimetric weather radars to more precisely detect major storms and precipitation.

The new antenna gives scientists the ability to evaluate thunderstorms and the size and distribution of rain, hail, and snow with better precision. The radar, known as CSU-CHILL, has the capability of seeing a single hail stone in the atmosphere more than 10 miles away.

CHILL, which has been at Colorado State University since 1990 under continuous support from the National

Science Foundation (NSF) and the state of Colorado, is jointly operated by the departments of Electrical and Computer Engineering and Atmospheric Science. ECE Professors V.N. Bringi and V. Chandrasekar and ATS Professor Steven Rutledge serve as principal investigators on the NSF award, which exceeds \$3 million over a three-year period.

CHILL provided unprecedented data on the July 1997 Spring Creek Flood in Fort Collins, recording a more accurate rain amount than the National Weather Service radars by nearly five inches over the duration of the storm.

"Some of the most exciting developments in radar took



*This spring, new antenna technology was installed on the CHILL radar. When looking straight up, the highest point of the antenna is approximately 50 feet above the ground. The antenna is made of aluminum and weighs nearly 6,000 pounds.*

place over the last decade, and we played a role," said Bringi. "The new technology helps us understand the finer structure

in storms. We can demonstrate the advancement of the science of meteorological radar right here at Colorado State."

### Research Spotlight:

## ECE Faculty Improve Radar for Military Use in Urban Areas

An electrical and computer engineering team has developed a military radar system that will track enemy movements through cities filled with tall buildings, trees, and other obstructions.

ECE Professor Edwin Chong led the \$1.6 million project for the Defense Advanced Research Projects Agency, or DARPA. Results reported by a U.S. Air Force Research Laboratory showed that Chong's team improved the detection of a target – and its tracking – tenfold with the radar system.

"Radar technology has become significantly more agile and flexible," Chong said. "But in urban areas, there are a lot of challenges to overcome with urban clutter and multiple

reflections from walls and other objects. We've designed these radar signals so they tell us much more information about the object that is being tracked."

Radar emits a pulse to identify an object's location and speed. The length of time required for the pulse to bounce off the object and return to the radar determines its location. In cities, buildings and trees can confuse the radar and send back multiple pulses, making specific location difficult to pinpoint.

Chong and Dr. Louis Scharf, co-principal investigator and professor of electrical and computer engineering at Colorado State, created methods to pinpoint how particular signals or waveforms bounce off buildings. They led a team that includes researchers from Princeton University, Rensselaer Polytechnic Institute, Naval Postgraduate School, and Melbourne University.

"This technology could be useful for other purposes beyond the military such as airport or university security or in the mountains," said Chong, who collaborates with companies such as Numerica, a small business in Loveland, Colo.

"Dr. Chong's nationally recognized expertise in optimization and sensor resource management is an invaluable help to Numerica in developing sensor resource management expertise in support of national defense," said Aubrey Poore, chief executive officer and chief scientist at Numerica, which works in the area of information science in support of defense and security surveillance. "In signal processing, Numerica also works with Dr. Scharf, one of the nation's foremost experts on a variety of projects. Both Dr. Chong and Dr. Scharf are exceptional people in mentoring our younger staff."

The research represents Chong's sixth DARPA award. Chong and Scharf have received several DARPA awards in the past for such projects as network modeling and simulation, military communication systems, and active sensing.



*Professor Edwin Chong led the \$1.6 million project for the Defense Advanced Research Projects Agency.*