

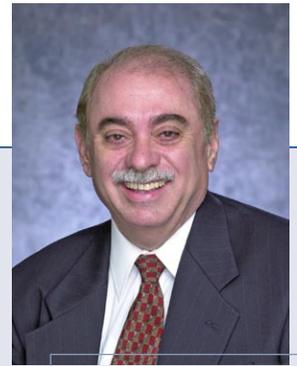
NC STATE UNIVERSITY

# nc state **ENGINEERING**



Fall 2008 • Engineering in the 21st Century: Critical Infrastructure

## From the Dean of Engineering



Louis A. Martin-Vega

As we begin a new academic year, I am delighted to share exciting news from the College of Engineering at NC State. The National Science Foundation (NSF) recently announced that it will provide \$18.5 million in funding over the next five years to establish the NSF FREEDM Systems Engineering Research Center (ERC) at NC State. Described as the “Internet for Energy,” this NSF ERC will support research and development of an innovative energy grid that will revolutionize the distribution of energy and facilitate the addition of new, green energy sources to the grid. The center is led by Dr. Alex Huang, and partner institutions include Arizona State University, Florida A&M University, Florida State University, and Missouri University of Science and Technology. As we celebrate this achievement, we recognize the responsibility associated with such an investment and look forward to working with our partner universities and industries to address the challenges of this project.

We also are celebrating the successful completion of the *Achieve!* Campaign. Thanks to the dedication and hard work of our NC State Engineering Foundation and our alumni and friends, the College exceeded its goal of \$225 million by more than \$40 million. This growth in the endowment provides critical funding for scholarships, fellowships and professorships that attract the best students and faculty to our college. I am grateful to all who helped us exceed our endowment goal.

In our last issue, we reported that the College moved up four places in the *U.S. News & World Report* ranking of graduate programs in the U.S. Recently released rankings continue to illustrate the strength of our programs. Our Engineering Online program has been designated the number one best buy for online engineering master’s degrees, and the Academic Ranking of World Universities for 2008 ranks the College among the top 25 engineering colleges in the world. This is no small accomplishment and is cause for celebration among our students, alumni, faculty, staff and the people of North Carolina. Having a highly ranked, strong engineering college attracts industry, retains jobs and builds the economy of our state.

We continue to make progress on a number of efforts within the College. Our enrollment is growing with more than 8,000 students enrolled in the fall semester. We are the fourth largest in the nation in number of BS degrees awarded. We welcomed 14 outstanding new faculty to the College this fall and look forward to the many contributions they will make in the coming years. Construction of Engineering Building III on NC State’s Centennial Campus is progressing, and we anticipate moving the departments of Biomedical Engineering and Mechanical and Aerospace Engineering into this new building by August 2010. We very much appreciate the North Carolina Legislature’s support for this building and for the planning and design of both engineering buildings IV and V.

In this issue of *NC State Engineering*, we explore efforts within the College in the area of critical infrastructure. We are proud to share how our faculty, staff, students and alumni impact our world through discovery, learning and innovation in transportation, security, communications and delivery of energy. While advancements in biotechnology, information technology, nanotechnology and energy and environmental systems are vital to our nation, critical infrastructure provides the access to these advancements, ensuring a secure, healthy and prosperous future. To this end, the College of Engineering provides leadership in developing new technologies and innovative approaches to the challenges of our rapidly changing world.

As we move forward, we acknowledge that our college—*your college*—is fueled by its people, the faculty, staff, students, alumni and friends who work together to “engineer a better future” for us all. I sincerely hope that you enjoy this issue of *NC State Engineering*, and I look forward to a continued dialogue with you on the future of our college.

– Louis A. Martin-Vega  
Dean, College of Engineering

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### About the Cover

The West Street electric substation in downtown Raleigh, photographed at night, and the traffic that passes by are examples of the critical infrastructure that NC State’s engineers work to improve through their research, teaching and outreach. We are grateful to Progress Energy for the use of this photo. (Photo: Thad Aman)

## nc state engineering

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Alumni, you can update your contact information online at [www.engr.ncsu.edu/ncef/registration](http://www.engr.ncsu.edu/ncef/registration), or send address corrections to NC State Engineering Foundation Inc. at the address above, or call 919.515.7458, toll free: 866.316.4057

## Engineering Online scores “Best Buy” ranking

The 10 online master’s degrees offered by the Engineering Online program at NC State have been named the No. 1 “Best Buy” for online engineering graduate degrees in national rankings published by GetEducated.com.

The program, which allows students to earn a master’s degree in engineering without coming to campus, cost \$6,930 for North Carolina residents and \$20,400 for out-of-state residents for the 2007–08 academic year. The average cost of a distance master’s degree in engineering was \$23,203, according to the survey.

GetEducated.com is the nation’s only clearinghouse dedicated exclusively to showcasing accredited online degree programs. Its rankings, released in July, were based on a national survey of 216 online engineering programs. GetEducated.com publishes the rankings every two years.

## Technology entrepreneur to deliver Progress Energy talk

Dr. Vivek Wadhwa, a Harvard Law School fellow, Duke University engineering professor and BusinessWeek.com columnist, will be the second speaker in “Solving. Evolving. Engineering: The Progress Energy Distinguished Speakers Series.” The event is scheduled for Oct. 30.

Wadhwa is Wertheim Fellow at Harvard and executive-in-residence and adjunct professor at the Pratt School of Engineering at Duke. He has founded two technology companies and been named a “Leader of Tomorrow” by Forbes.com.

The series, sponsored by Progress Energy, was created to foster dialogue around engineering’s capacity to solve some of the world’s greatest challenges. Author and technologist Steven Berlin Johnson delivered the inaugural talk on March 11.

## Dean Martin-Vega meets with top engineers in Brazil

Dr. Louis A. Martin-Vega, dean of the College of Engineering, met with researchers and administrators at four of the top engineering schools and the national energy institute during a trip to Brazil this spring.

Martin-Vega and other faculty and administrators from the College shared presentations about NC State and learned more about Brazilian engineering research and education. The NC State delegation also met with a number of NC State alumni who live in Brazil.

Participants concluded that College departments should continue to develop strong connections with Brazilian engineering schools. The College can benefit from research collaborations and faculty and student exchanges.



Brian Koehler, Dean Martin-Vega, Dr. Paul Cohen and Dr. Bob Young met with Orlando Strobel, center, dean of engineering at Pontificia Universidade Catolica do Parana in Curitiba, Brazil.

## Engineer's performance combines math and music

A visiting engineer combined mathematics and music to deliver a unique performance at NC State this spring.

Dr. Elaine Chew, associate professor of industrial and systems engineering and electrical engineering at the University of Southern California (USC) Viterbi School of Engineering, performed a concert entitled "The Mathematics in Music" at the Talley Student Center in March. Chew discussed tonal combinations and melodic transformations and performed several works to illustrate her research. She also gave a private lecture for the Operations Research Graduate Program at NC State.

Chew founded and heads the Music Computation and Cognition Laboratory at USC, and her research centers on the computational modeling of music and its performance. As a concert pianist, she has performed as a soloist and chamber musician in North America, Asia and Europe.

## Fang helps China prepare for Olympics

While athletes around the world were busy preparing for the recent Summer Olympics in Beijing, Dr. Shu-Cherng Fang was helping Beijing prepare for them.

Fang, the Walter Clark Chair and Alumni Distinguished Graduate Professor in the Edward P. Fitts Department of Industrial and Systems Engineering (ISE), coordinated two symposia designed to prepare Beijing organizers to address issues ranging from transportation to trash recycling to terrorism. It was the first time China had hosted the Olympics, which ran from Aug. 8–24.

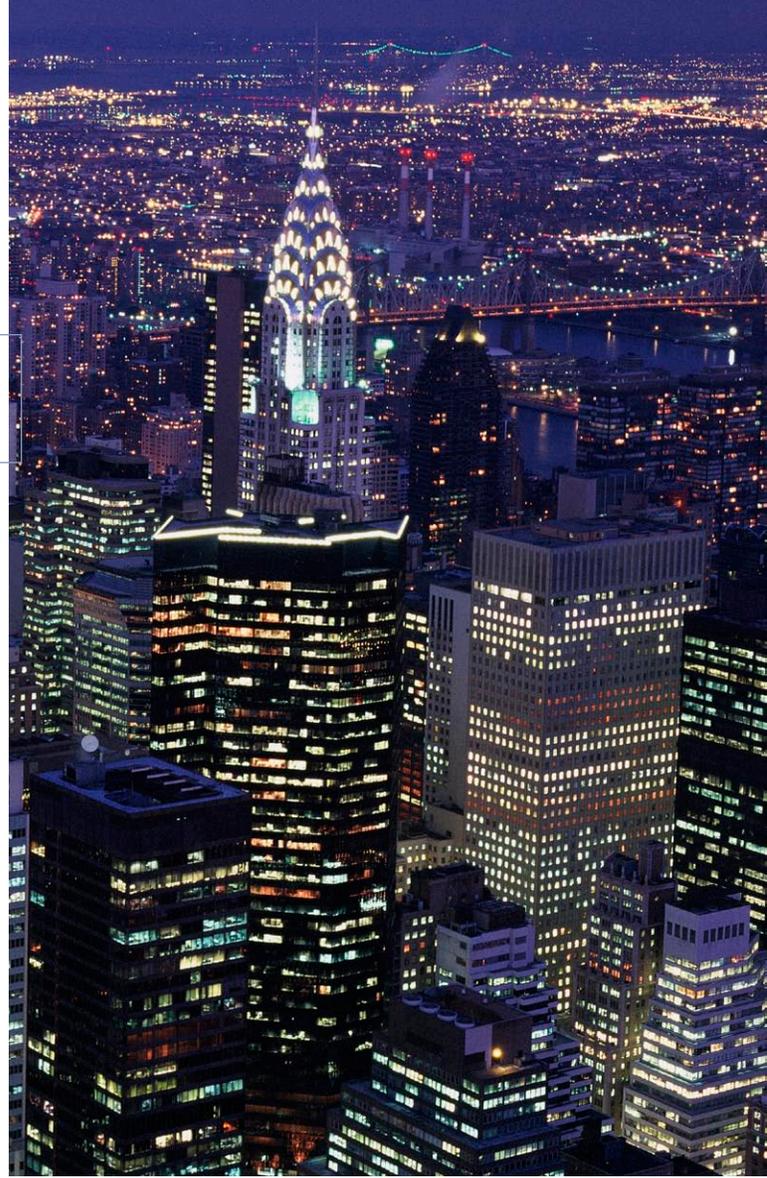
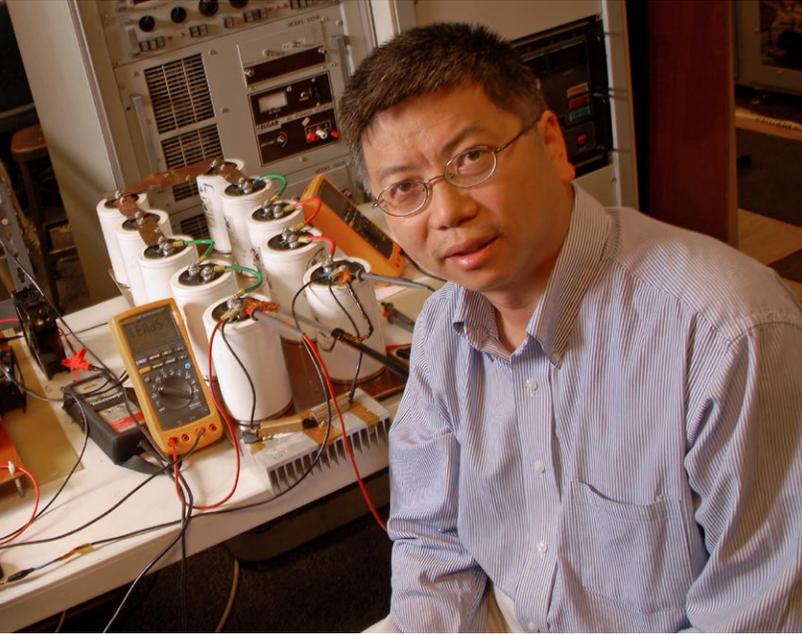


Above: Visiting engineer Dr. Elaine Chew gave two presentations at NC State this spring.

Below: Dr. Shu-Cherng Fang, shown here on the Great Wall of China, helped organizers prepare for the Beijing Olympics.

ISE professors Salah Elmaghraby and Xiuli Chao also took part in the events, which were hosted by NC State partner Tsinghua University.

Below: Dr. Alex Huang, an expert in electric power systems, will direct the new FREEDM Systems Center.



# FREEDM from Fossil Fuels Within Reach

NSF Engineering Research Center  
proposes new ways to harness  
and distribute green energy.

Waves breaking on a shoreline. Sun beaming through a window. Breeze cooling a hot summer day. Examples of nature's beauty—and sources of boundless energy.

But creating the technology to distribute that energy to millions of cars, homes and factories remains one of the world's great engineering challenges. Armed with a new grant from the National Science Foundation, NC State will help meet it.

NSF recently awarded the university and its partners a five-year, \$18.5 million Engineering Research Center grant, one of only five such grants awarded by the federal agency this year. The center will also be supported by \$10 million in institutional support and industry membership fees. The grant, which is renewable for an additional five years, creates the Future Renewable Electric Energy Delivery and Management (FREEDM) Systems Center on NC State's Centennial Campus.

NSF announced the new center in September, culminating an 18-month application-and-review process.

"Securing this center is a landmark achievement for the College and the University that will add significant resources and momentum to NC State's energy research," said Dr. Louis A. Martin-Vega, dean of the College of Engineering. "The technology developed at this center will distribute renewable energy on a large scale, helping to build a society based on green energy."

Researchers with the FREEDM Systems Center say the key to solving the looming energy crisis is not necessarily generating the renewable energy itself but developing the infrastructure to manage and distribute it throughout the country.

The new center will improve existing power technology and develop new control and management devices that will allow the nation's power grid to easily deliver energy produced from a variety of sources to consumers that need it. This "Internet for energy" will enable millions of users to generate their own energy from renewable sources and

allow excess power to be stored or sold. The technology will ultimately reduce dependence on fossil fuels, lower carbon emissions and accelerate further innovation in the field of renewable energy.

Dr. Alex Huang, Progress Energy Distinguished Professor of Electrical and Computer Engineering and director of the Semiconductor Power Electronics Center at NC State, will be the center's director. He will collaborate with faculty at partner universities, including Arizona State University, Florida A&M University, Florida State University, Missouri University of Science and Technology, RWTH Aachen University in Aachen, Germany, and the Swiss Federal Institute of Technology in Zurich, Switzerland.

"We are honored that NC State is playing such an important role in this research," Huang said. "Work at this center will help prepare our country to take full advantage of its abundant renewable energy resources."

Central to the research will be the development of a "green energy hub" that will power the center's headquarters and other buildings on Centennial Campus. The one-megawatt FREEDM System will serve as a testbed for the center's research efforts. Industry partners will have access to the center's faculty, students and facilities, speeding the time it takes for new inventions to reach the commercial marketplace. More than 65 companies have committed to joining this global partnership.

Education will also play a key role in the center. A new master's degree program is being created, as well as an undergraduate concentration area in renewable energy systems. Researchers have also fostered partnerships with 14 middle and high schools to give younger students a chance to explore the research.

Researchers believe the center will provide a framework for a societal shift to green energy. When that happens, they see a much sunnier outlook for the economy and the environment. ■

# Road Warrior

For Joseph Hummer, when it comes to road design, “we don’t have to settle.”



Dr. Joseph Hummer’s research on road signs, systems and markings helps keep drivers safe.

“I think the first traffic fatality in this country was in 1902, shortly after the invention of the automobile,” said Dr. Joseph E. Hummer, professor of civil, construction, and environmental engineering at NC State. “We’ve been killing people on the roads for over 100 years now, and we don’t have to.”

Hummer has built his career around improving road systems and motorists’ safety, from his current research into road signs and pavement markings to his best-known research into the use of what he calls the unconventional intersections and interchanges, which he considers his niche in the field.

“People look at me like I’m nuts when I say I can improve intersections and interchanges,” he said, “because we’ve been doing intersections over 100 years and interchanges for 80. What’s left to learn? But there are always different and better ways to do even the most dry and mundane things.”

Every year, Hummer said, 40,000 to 45,000 people die on our roads.

“The number of fatalities in the U.S. has remained steady, and the number of fatalities worldwide has gotten worse,” he said. “So really, we’re further from solving the problem.”

Through his work, Hummer has been finding solutions. His reward is seeing innovative designs gain some traction and get put to use.

Just one of the project designs picking up popularity is the super-street, where dangerous left turns are eliminated at intersections so that traffic on a main road flows in conventional lanes and left-turning traffic from side streets use median U-turns. It's a design that came to his attention back in 1992 when he did his first project at NC State, and he's been pushing it ever since. He's finally seeing results. Now there are five or six functioning super-streets in North Carolina, he said.

"And they're working," Hummer said, "they're working like we predicted 15 years ago."

Next to designing creative solutions for these "mundane" traffic problems, Hummer hopes to pass on his love of his profession and his drive for improvement to his students.

"They enjoy working on designs like these in class," Hummer said. "I get comments like, 'This is why I decided to be a civil engineer.'"

Hummer is currently researching the wear patterns of pavement markings—the painted lines, arrows and messages that note lanes, directions and warnings—in order to advise transportation authorities on when and how to best replace them. He recently finished conducting similar research on road signs as part of an ongoing and multi-stage project with the North Carolina Department of Transportation.

Redesigning roads is a preventative measure, Hummer said. It's a lesson he picked up from Ezra Hauer, a professor at the University of Toronto and one of the world's foremost experts in highway safety.

"He has shown," Hummer said, "that improvement is always possible. That we don't have to settle for killing 40,000 people a year. In fact, it's the reverse—it's an outrage." ■

## Alaskan earthquakes – in North Carolina



Alaska is prone to earthquakes. In fact, North America's largest earthquake was recorded there in 1964. Pair that with cold temperatures that can weaken steel, and what results is a dangerous area for motorists cruising on the state's bridges.

That's why NC State researchers are studying how bridges react during earthquakes in below-freezing temperatures. Associate professors Mervyn Kowalsky and Tasnim Hassan, along with Professor James Nau and three graduate students, all with the Department of Civil, Construction, and Environmental Engineering, have been using the department's state-of-the-art Constructed Facilities Laboratory (CFL) on Centennial Campus to perform the research.

The CFL is a perfect fit for the work because it features a large environmental chamber where researchers can test the bridge columns at -40 degrees Celsius during a simulated earthquake.

This combination of capabilities is unique in the United States, which is why Alaska transportation officials have funded several research projects at NC State.

Six full-scale bridges will be tested at the CFL during 2008 and 2009.

# Inside the fight for privacy protection

One computer scientist gets  
everyone involved.



Dr. Ana Antón is an internationally recognized expert on privacy policy in software systems.

Coming from a family of physicians, Dr. Ana Antón knows that protecting privacy is important.

The professor of computer science at NC State is a spokesperson for the cause, as she has become an internationally recognized expert on privacy policy in software systems. She's breaking new ground in the field by bringing legal and technical minds together to tackle complex privacy policies, the technology that supports them, and the practices that can lead to security breaches and data leaks.

"There's no way we can solve this problem by just sitting around in our offices with other computer scientists," she said. "You have to talk with people in other fields. With lawyers. With lawmakers. With chief security, privacy and information executives in companies."

Antón's research began with analyzing privacy policies. This led to investigating data breaches and suggesting ways to prevent them. But now she's taking it further, bringing these issues to light by speaking at panels and workshops and even testifying before Congress. She works to make information more secure by educating lawmakers and policy writers and trying to reduce the complexity of privacy policies so people can actually understand them. She's pushing to hold companies accountable for protecting the personal information in their possession and urging them to reduce vulnerabilities in the software systems that handle it.

At NC State, she's seeking the establishment of the Institute for Science, Technology and Engaged Public Policy (InSTEPP) to apply science, technology and engineering to public policy and to encourage university-wide communication that will extend to national interaction.

But all these endeavors start with changing mindsets and emphasizing multidisciplinary approaches.

"We're slowly getting into the right circles and working to get lawmakers to understand—when you're writing law, if it governs information systems and you expect us to implement software—we need to work together." ■

# Social security

Dr. Ting Yu envisions a social network that everyone will trust.

So you log onto Facebook and see that one of your friends has recommended a new gaming application. You like games, so you click on the link and learn that the program will access your personal information before you sign up.

Do you trust it, or not?

Dr. Ting Yu wants to help answer that question. Yu, assistant professor of computer science, is building a tool to help improve trust among users and applications in social networks. He's also looking at ways to allow researchers to study this growing social phenomenon without violating users' privacy.

"Trust and privacy issues are just unavoidable for such a popular system," said Yu, who joined the NC State faculty in 2003. "And I think if we have a very reliable and secure online social network it can benefit many people."

Aiding the research is a Faculty Early Career Development award from the National Science Foundation that Yu received earlier this year. The award, known as the NSF CAREER Award, is valued at \$450,000 and runs from 2008 to 2013.

The funds will help Yu develop a tool that allows social network users to evaluate the trustworthiness of the applications and people they meet online. Many Facebook applications such as Scrabble and Flixster, for example, were developed by outside entities, and Yu wants to give users a way to decide if those applications are safe to use.



Dr. Ting Yu, (center) wants to improve trust among users and applications in social networks.

As these networks become more popular, researchers want to learn more about how people use them. Yu is developing a model that allows researchers to access large chunks of social network data without giving away users' personal information.

So, if a researcher wants to learn more about online dating, Yu's model would allow the researcher to glean lots of general information without learning who has a crush on whom.

"We want to make it a safe, but still popular, environment," he said. ■

# Nuclear renaissance

Need for more energy sources  
boosts interest in nuclear power.

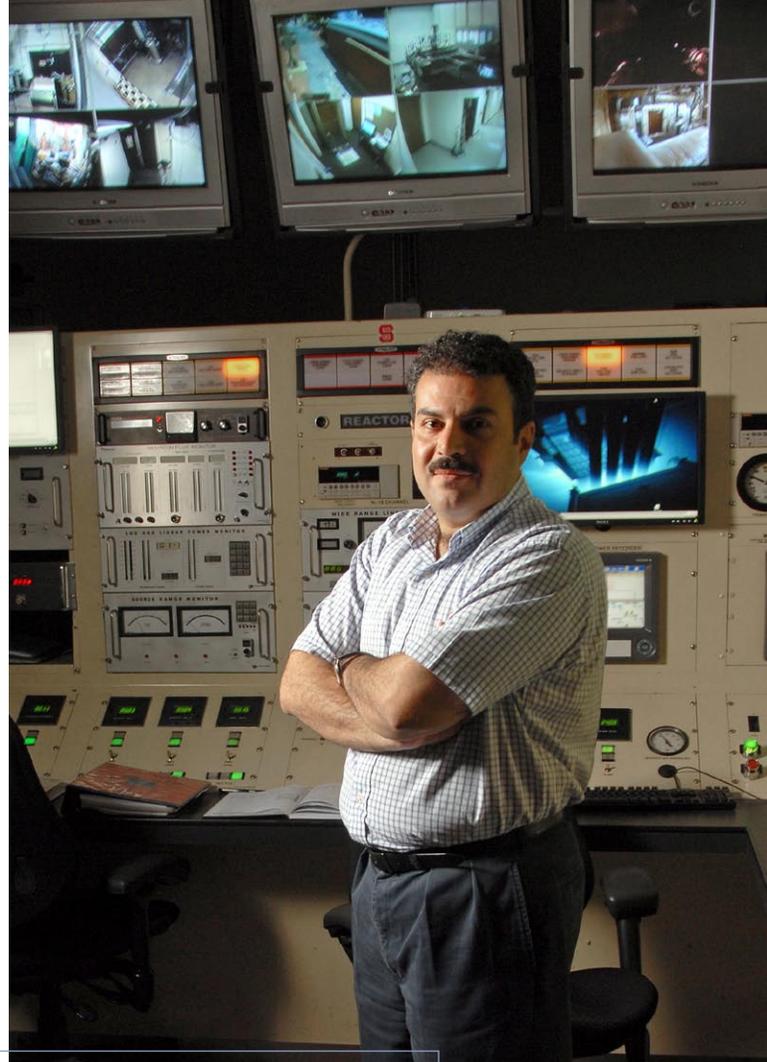
Nuclear energy is becoming more popular with researchers and the general public as Americans seek more sources of power. Dubbed the “nuclear renaissance,” this upswing in research, discovery and popularity is driven by the same issues of accessibility and utility at the heart of the Nuclear Reactor Program at NC State.

Among the leaders of this advancement is Dr. Ayman Hawari, associate professor of nuclear engineering and director of the Nuclear Reactor Program. He has guided the program to some landmark achievements.

They include the low-energy positron beam that set a world record for its positron rate last fall. The project dates to 2002, when NC State led a multi-university consortium that used new federal funding to start the beam project and others. A \$1 million National Science Foundation grant helped bring the beam to NC State.

Then there’s what Hawari calls some “upcoming milestones” in the ultra-cold neutron source project, which will finally allow neutrons to be contained at large densities and studied over long periods of time.

These projects and others are central to the program’s mission: education, scientific exploration and service. The program, which began in 1953 when NC State began operating the nation’s first public research nuclear reactor, still does



Dr. Ayman Hawari directs the Nuclear Reactor Program at NC State.

all of its training and experimentation for researchers, students, professionals and the public.

“And we hope that we can continue to increase the utility of the program,” Hawari said.

Many of the old stigmas of nuclear power are disappearing, Hawari said, thanks in part to research focused on transforming what was nuclear “waste” into useful byproducts that can be incinerated to produce additional energy. In fact, Hawari said, the carbon footprint of nuclear power is comparable to other renewable energy sources.

“Everything translates to drive this nuclear renaissance forward,” he said, “and I don’t think it’s going to stop.” ■

For more information on the Nuclear Reactor Program, visit [http://www.ne.ncsu.edu/NRP/reactor\\_program.html](http://www.ne.ncsu.edu/NRP/reactor_program.html).

# Solar power for the masses

NC State research could help make solar energy less expensive.

In 1979 a team led by Dr. Salah M. Bedair, professor of electrical and computer engineering at NC State University, revolutionized solar energy by creating a first-of-its-kind solar cell.

Now, in 2008, he's trying to build upon that research. The results could make solar energy less expensive for consumers.

This time he's accompanied by Dr. Nadia El-Masry, professor of materials science and engineering, and Dr. John Hauser, professor of electrical and computer engineering. Their goal of improving efficiency could make solar energy production more feasible on a large scale and finally practical and affordable for public use—a goal more than 20 years in the making.

When Bedair began working with his team in the late 1970s, solar cell efficiency was at about 16 percent—meaning the cell was only converting 16 percent of the sun's energy into usable energy. Their goal was to increase this, and their work produced the first multiple-junction solar cell.

“Because solar radiation is made of different wavelengths,” Bedair explained, “the absorption of each wavelength has to be considered separately.”

The original structure they pioneered had two junctions, each capable of separately absorbing a different wavelength. After much research and improvement, the modern incarnation of that original structure is now produced by Spectrolab, a Boeing company. This cell has three junctions and yields 40 percent efficiency.

The ideal efficiency for a structure capable of absorbing every wavelength would be 70–80 percent, according to Bedair, and



Dr. Salah M. Bedair (left) and Dr. Nadia El-Masry (center) want to make solar energy more cost-effective for consumers. The researchers do their work in labs on Centennial Campus.

though this figure would be “nearly impossible” to achieve, they still hope to improve efficiency by five percent by adding a fourth cell junction. The impact of that increase, he said, will have a huge and immediate impact on the energy market and consumers as solar energy becomes less expensive.

As Bedair pointed out, “at a solar cell station, producing tens of thousands of kilowatts, a five percent increase in efficiency means massive changes in energy production and cost efficiency.” ■

# Virtual Computing Lab keeps making headlines

The Virtual Computing Laboratory (VCL) continues to draw attention as a revolutionary and cost-effective way for students, faculty and staff to access—via broadband Internet connections—powerful computing resources and software from anywhere at any time.

The system, introduced at NC State in 2004, is one of the first large-scale examples of “cloud computing” operating in an educational setting. This technology lets users run software on high-powered servers, including advanced computing clusters, rather than on a personal computer. VCL lowers hardware and software costs because it shares resources among its users and readapts itself when new users want to use different sets of applications.

Several community colleges and universities across the state are already using the VCL system, and eventually K-12 students will have access to it as well.

VCL received national attention this spring when *The Chronicle of Higher Education* published a feature story on the project. The article, headlined “A Computer Lab That Students Use but Never See,” discusses the history of the lab, its growing reach across the state, and recent donations from IBM and Intel totaling \$3.6 million that have helped support it. NetApp is also contributing to the project.

The story noted that George Mason University in Virginia is starting a similar lab based on the NC State model.

The VCL made news again this spring when NC State launched its Secure Open Systems Initiative, a research effort that will help make computer systems that are based on open solutions more secure and trustworthy. As part of this effort, a VCL-based test-bed will be developed to study security-related issues.

U.S. Rep. David Price, who represents North Carolina’s 4th Congressional District, was the keynote speaker at the kickoff event.

“The work being done at NC State just keeps reaching new levels of excellence,” said Price, who helped secure the \$3.5 million in federal funding that started the initiative. “Seeing something like this makes my job worthwhile.” ■



A VCL-based test-bed will be developed for the new Secure Open Systems Initiative (SOSI). Dr. Mladen Vouk, right, speaks with a researcher via live video feed during the SOSI kickoff event this spring.



Left: Serious games developed at NC State include this re-creation of the Monterey Bay Aquarium, in which game characters provide information about the aquarium's habitats that is tailored to each player's interests, background knowledge and reading level.

Above: Dr. R. Michael Young, left, met with U.S. Rep. David Price during an exhibition on Capitol Hill in June.

# NC State, Triangle area serious about gaming

North Carolina's Research Triangle area is fast becoming one of the nation's premier locations for digital games companies. And NC State is a big reason why.

The university's new Digital Games Research Center (DGRC) focuses on research and education in digital games technologies and uses its technical expertise, facilities, licensing capabilities and top-notch graduates to build relationships with companies in the industry. The center's faculty come from the colleges of Engineering, Education, Design, Management, and Humanities and Social Sciences.

Officially created in May 2007, the center is housed in the Department of Computer Science, which recently added a game development concentration to its undergraduate curriculum. According to Dr. R. Michael Young, associate professor of computer science and co-director of the DGRC, ongoing efforts between the DGRC and the economic development offices at NC State and Wake County are helping to make North Carolina a major player in the gaming industry.

"North Carolina is unique in its combination of the leading game companies that are headquartered here, its world-class research universities and the many North Carolina high-tech firms seeking to employ advanced technologies to address training and workforce issues," Young said. He shared this message with members of Congress during an exhibition on Capitol Hill in June.

The Triangle boasts more than 30 game-development companies, including Electronic Arts, Epic Games, Emergent Game Technologies and Red Storm Entertainment. Insomniac Games recently added its name to this list, announcing plans to open a studio in the area in 2009.

Many of the game companies in North Carolina focus on the development of serious games, which range from military simulations to surgical training to children's educational software. The North Carolina serious games industry was the topic of this spring's NC State Economic Development Forum, which brought together more than 100 business and academic leaders to share ideas and discuss trends.

The conference attracted speakers from the U.S. Department of Defense, WakeMed Health & Hospitals and local game-development companies, showing the wide range of applications and industries to which serious games are contributing.

Jim Zuiches, vice chancellor for extension, engagement and economic development at NC State, was impressed with the conference. He said, "I think that we are seeing the future of learning in the discussion and presentations today." ■

## Rocking for a good cause

Engineers Without Borders raises money to help people abroad.



Dozens of NC State students were wailing this spring.

They weren't sad about anything—they just wanted to rock.

The NC State chapter of Engineers Without Borders held a Guitar Hero contest in April to raise money for its humanitarian projects in Bolivia and Sierra Leone. The chapter is part of a national group that partners with developing communities on engineering projects that improve quality of life.

William McGuire, a senior in aerospace engineering who led the organizing efforts, said Guitar Hero was a natural choice for a fundraising event. Players use a guitar-shaped controller to play rock anthems scrolling on a screen, an interactive feature that has helped Guitar Hero become one of the world's best-selling video games.



NC State students dressed the part during a Guitar Hero fundraiser for Engineers Without Borders.

"Everybody wants to be a rock star," McGuire said.

"So we thought, 'Hey, let's use the game that lets them be a rock star.'"

But first there was plenty of work to do. Students spent dozens of hours lining up sponsors, designing a website and creating marketing materials. For McGuire and the rest of the organizers, it was a labor of love.

"It didn't really matter how many hours, how much pain, how late we had to stay up, how inconvenient it was," McGuire said. "In our minds, we were serving a purpose greater than ourselves."

Organizers logged those long days to help people. In Bolivia, the chapter is working to improve water quality at a small town's community center. Engineers discovered that the center's primary water source, a spring from a nearby mountain,



was contaminated with E. coli. And the water source ran dry during the eight-month dry season.

To fix the problems, engineers designed a

solar disinfection system in which water is poured into plastic bottles and left outside. Ultra-violet rays deactivate the contaminants. The students also designed a rainwater harvesting system as a second water source; they planned to install both designs later this year.

The group is also raising money to pay for a trip to Sierra Leone, where students want to build a water-sanitation system and a device that harnesses solar and wind energy to power lights, fans, lab equipment and computers in a community center. The group hopes to make the trip in December.

With all that in mind, students worked hard on the Guitar Hero event, signing up more than 50 contestants and 26 “groupies.” Winners took home gaming gear, and the Brooks Wood Band provided entertainment during breaks in the competition for the 250 or so attendees.

In the end, the competition raised more than \$1,000 and helped build relationships between the group and 17 event sponsors. The event also raised EWB’s profile, as organizers handed out more than 10,000 flyers and drove plenty of traffic to the group’s website.

EWB leaders are already working with sponsors, campus leaders and non-profits to bring even more attention to next year’s events.

“The best part is that we can really help those in need abroad, while having fun doing it,” McGuire said. ■

*For more photos and video of the Guitar Hero event, check out [www.ewbguitarhero.com](http://www.ewbguitarhero.com). Visit [www.ewbnctu.org](http://www.ewbnctu.org) for more information on projects and events.*

## Green Team: Students to design EcoCAR



NC State was among 17 universities recently selected to participate in EcoCAR: The NeXt Challenge, an engineering competition in which students re-engineer a sport-utility vehicle for improved fuel economy and reduced emissions. The three-year competition begins this fall. When it’s over, sponsors hope to have a vehicle prototype that is ready for production.

Terry Gilbert, lecturer and undergraduate laboratory director in the Department of Mechanical and Aerospace Engineering, will be the faculty advisor for the three-year competition. The students leading the project are members of the student club WEEL, or Wolfpack Energy Efficient Locomotion.

Each of the teams receive \$10,000, a Saturn VUE donated by General Motors, a trained mentor providing technical support and various powertrain components that help the teams complete the project. Sponsors include the U.S. Dept. of Energy and General Motors.

Teams are required to incorporate “green” technologies into their design, such as fuel cells and plug-in hybrid capabilities. Alternative fuels such as ethanol, biodiesel and hydrogen are also encouraged. The modified vehicles are required to maintain or improve upon stock performance and customer appeal.

The teams design the vehicles during the first year of the competition. During the second and third years, the teams build the vehicles and refine their performance. At the end of each of those years, the vehicles undergo a week of engineering tests that determine the vehicles’ greenhouse gas impacts and readiness for production.

# Inventing the future

Student biomedical projects could end up at hospitals everywhere.

Not all of the inventions produced in NC State's biomedical engineering program were created by veteran researchers with PhDs.

Many of the inventors are undergraduates, and their creations could become commonplace in clinics and hospitals all over the world. The top-notch students of the Joint NC State-UNC Department of Biomedical Engineering (BME) continue to break ground in this relatively new field.

"It was just really interesting to see how many different research opportunities are available (in biomedical engineering) because we don't know so much about it," said Sneha Rangarao, a senior who helped invent a super-absorbent floor mat. "It's a growing field."

Rangarao and other students designed the floor mat for Senior Design, the department's capstone undergraduate course. The students teamed up to work on the projects, gleaning ideas from local hospitals that had problems that needed solving. This year's NC State senior design group saw teams working with WakeMed, Rex-UNC Health Care and NC State's College of Veterinary Medicine and Department of Mechanical and Aerospace Engineering.

Projects are derived by students using a process involving an assessment of real clinical needs. Andrew DiMeo, the senior design instructor, believes this process helps "lead to the prolific invention disclosures we submit from this course." This year's senior design group produced 10 invention disclosures, up from seven last year.



Nathan Cox was part of a team that created a more efficient way to lower a patient's body temperature during a major trauma. The team presented its work at WakeMed this spring. (Photo: Julianne Macie, WakeMed)

DiMeo, director of industrial relations for the department, brings his own experiences to the course. He had been a graduate student in BME at UNC-Chapel Hill before taking a leave of absence to start a family. He entered the private sector, work that included time at Alaris Medical Systems and Gilero, a service company he co-founded that specializes in high-volume medical devices. He also founded the North Carolina Medical Device Organization, a nonprofit with a mission to make the state's medical device and diagnostic industry a world leader in research, development and production.

DiMeo stayed close to NC State, serving on the Board of Advisors to the undergraduate BME program and befriending Dr. Frank Abrams, who ran the senior design course at the time.

When Abrams retired a few years ago, the department was looking for someone with real-world experience and industry connections to lead the course. DiMeo was a natural fit.

Several of the projects DiMeo has shepherded through senior design show great promise to enter clinics. Among them are a fluid control system for patient simulators and a positioning device that allows X-Rays to show the appropriate part of a patient's leg without interference or patient discomfort.

Rangarao's team got its idea by observing operating rooms at WakeMed. When team members spoke with doctors about the various challenges they faced, the students found that the risk of blood, saline solution and other fluids falling to the floor created safety hazards during surgeries. The current method of cleaning it up was to put a bunch of rags on the floor, Rangarao said.

So Rangarao and the rest of her team designed a disposable, inexpensive floor mat. A couple of investors who saw the mat this spring liked what they saw, so it could have a future in operating rooms.

"There is an interest in it," she said. "Definitely." ■

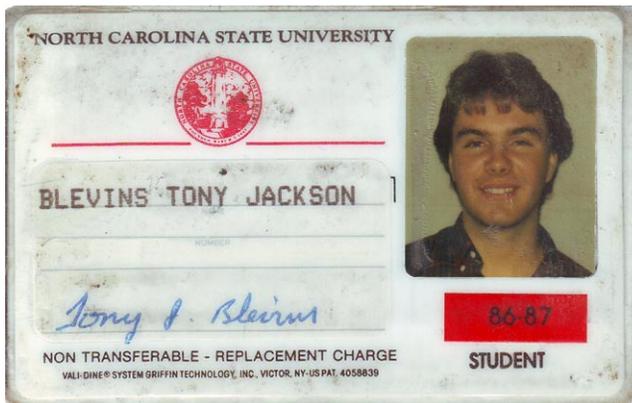
*For more information on the senior design program in biomedical engineering, visit [www.bme.ncsu.edu/seniordesign](http://www.bme.ncsu.edu/seniordesign).*



Above: Katie Woodruff and Peter Hamilton show off their senior design project, a unit that neatly houses EKG wires during a stress test, during a symposium in Research Triangle Park. Below: Andrew DiMeo is the senior design instructor for NC State's biomedical engineering program. (Photo: Julianne Macie, WakeMed)

# iPioneer

Engineering alumnus plays key role at Apple.



When Apple product designers began thinking about a new kind of mobile phone, they started with the phones they had.

And they didn't like what they saw.

“We all hated our phones,” said Tony Blevins, a 1989 NC State industrial engineering graduate who is a core member of Apple's iPhone team. “The genesis of the iPhone was that simple. We said, ‘We think we can do much better.’”

So they designed the iPhone, which hit stores in 2007 to rapturous praise from critics and consumers. Within a year, the company had sold six million iPhones. A new version was unveiled this year to more critical acclaim.

Blevins has played a key role in the iPhone's success. As a senior executive at Apple, he is responsible for the operations of the iPod and iPhone business units. Duties include designing and managing supply-chain and product-cost relationships, as well as product fulfillment and delivery.

The job is one part technical, one part relationship-based, and all parts intense. Blevins draws on his engineering background to negotiate his long workweeks and extensive international travel schedule.



Above: Tony Blevins' NC State ID card. Blevins says his NC State engineering education helped prepare him for a successful career at Apple.

Below: Blevins and Tiffany Vu watched the NC State football team play Maryland in 2007.

“What I learned at NC State more than anything else is how to develop and apply analytical thought patterns and processes to any particular problem,” Blevins said. “And that’s what I rely on when I’m in really difficult situations.”

Blevins grew up in West Jefferson, N.C., a small town in the northwestern corner of the state. He excelled in school and received academic scholarships to attend NC State and Duke. He chose Raleigh over Durham.

“Growing up in North Carolina,” he said, “my allegiances were always to NC State.”

After graduation, he obtained a master’s degree in international business from the Massachusetts Institute of Technology and landed a job at IBM, where he had international assignments in both Europe and Asia and remained for 12 years.

He eventually moved west to take a job with Apple, and he’s been with the company during its best years. From 2000 to 2007, the company’s annual revenues grew from \$6 billion to more than \$24 billion.

On the company’s culture, Blevins said it might surprise some people to walk into an Apple meeting and see something that looks “more like a United Nations meeting.” As many as 20 different nationalities are often represented, he said.

Those perspectives help keep Apple’s products fresh, and the company’s famously secretive culture keeps them under wraps until they’re released. Apple, Blevins said, chooses to let its products “do the talking.”

“You’ll never find anyone from Apple describing in any detail whatsoever what we do or how we do it,” he said. “It’s very core to the company.”

Blevins has given back to his alma mater. Each March, he hosts students, faculty and staff with the NC State Engineering Entrepreneurs Program at his beachfront home in California. He also visits with the same group at Apple’s headquarters in Cupertino, sharing tips on leadership and business.

The transition for Blevins from a small North Carolina community perhaps best-known for its Christmas tree farms to the cutting-edge technology world of Silicon Valley was a somewhat unusual route. Blevins said the odyssey has been enabled and fueled by his NC State education.

To that, he says, “Go Pack.” ■



Blevins (back row center, in red) hosted NC State students, faculty and staff with the Engineering Entrepreneurs Program at his California home in March.

# Simulating for safety

Researchers use simulators to improve safety on the road and in the air.

Dr. David Kaber and ergonomics graduate students at NC State use some exciting tools for their research.

An immersive, three-screen driving simulator tests driver awareness. A walking simulator assesses visual factors in slips, trips and falls. A flying simulator tests pilots' abilities to handle unexpected course corrections in commercial aircraft with sophisticated automated systems.

The simulators in the Ergonomics Laboratory in the Edward P. Fitts Department of Industrial and Systems Engineering are much more than high-tech video games. Researchers use them to help explain how humans think under high workloads and time pressure while using automation in transportation systems.

"I think one of the coolest things about this research is that we get to use some pretty serious simulators in all our projects," said Kaber, a professor in the department.

Kaber and his students received media attention a few years ago when they published research showing that drivers who talked on cell phones were distracted, even when they used adaptive cruise control technology that adjusted vehicle speed to maintain a constant distance from a lead vehicle. It's now widely accepted that cell-phone use distracts drivers, and New York, New Jersey and other areas have banned the practice.



Above: Researchers use a simulator to see how motorists talking on cell phones perform during hazard situations—such as a wreck.

Left: A walking simulator could help manufacturers design personal navigation devices that don't distract users.

But few studies have linked “dialing and driving” to specific performance degradations. Kaber’s current work seeks to identify how drivers perform in hazard situations—a wreck or a fast-approaching median—when distracted by cell phones and other devices. He’s particularly interested in seeing how younger and older drivers react in these situations, as traffic incident data indicates performance differences between certain age groups.

The results of this research could provide greater insight into driver thinking and performance across age groups and help manufacturers design less distracting in-vehicle technologies. The work may also help lawmakers decide how to further regulate cell-phone use.

The ergonomics group is also conducting research for NASA. In one project, Kaber and his students are using a flight simulator to develop a pilot performance modeling tool to help aircraft manufacturers better design automated navigation control systems.

“New interfaces should allow pilots to smoothly switch between computer and manual control when dangerous situations arise,” Kaber said.

The group has also developed a simulator that puts a treadmill in front of a wall-sized virtual reality screen. Research participants walk on the virtual “sidewalk” while using a cell-phone or other handheld navigation device. An experimenter tries to trip participants, assessing their reaction abilities while using the devices. (A harness catches the participants who fall.)

The research could help the military determine multitasking workload limits for its personnel. The work could also help manufacturers design personal navigation devices that don’t distract users.

“We’ve organized our research according to a taxonomy of human mobility,” Kaber said. “If you start out with aviation, we look at piloting. We look at driving. And we’re all the way down to walking.” ■

## Timesavers: Researchers finding ways to improve cell-phone design



Everyone who owns a cell phone knows the frustration of sifting through menus, choosing and re-choosing options, and looking for that one feature that seemed so easy to use in the advertisement.

But with better menu designs, those aggravations could end. According to research conducted by NC State computer scientists, “if 2 billion users were to use their cell phone menus every day for just three seconds, our improvements could save almost 30 years of user time per day.”

Those findings, published last year in the journal *ACM Transactions on Computer-Human Interaction*, came from research conducted by Dr. Robert St. Amant, associate professor of computer science. He and his team research different models that would help manufacturers design better user interfaces and menus on cell phones.

“There are many ways to design cell phone interfaces,” said St. Amant. “But what’s lacking is a good way to decide which design is best.”

So his team collects and analyzes data from simulations and usability studies done by collaborator Dr. Frank Ritter at Pennsylvania State University. Ritter, along with NC State graduate student Thomas Horton, co-authored the Transactions paper with St. Amant.

With engineering models capable of accurately showing and predicting how long it takes users to find and use various functions on phones and similar personal devices, manufacturers can tailor designs to what functions people use — and how they find them.

# Student experiences help state economy

IES program gives students on-the-job training.

The Industrial Extension Service is known for connecting North Carolina businesses with NC State resources, knowledge and experts.

But it also connects those companies with some of the state's most valuable assets: NC State students.

Among them is Jason Snead, one of many students across the state working through IES as part of the Student-on-Demand program.

Snead graduated in 2004 with his industrial engineering degree and began working on projects with IES as a Post Baccalaureate Studies (PBS) student preparing for a master's program.

He wanted work experience, and he got it. From a lumber mill to an insurance office building, plus several manufacturing facilities, he's had a good look at the types of jobs out there for industrial engineering graduates.

"The program can give you a little bit of everything," he said.

Not only do students get to sample different work experiences, they can apply concepts learned in class to real world environments.

"You get that training in the classroom," he said, "but you really understand it when you get outside and into these companies."

Most recently Snead has been working with the Raleigh Lions Clinic for the Blind as the group prepared to reorganize and shift its entire manufacturing facility layout. Snead was called in to measure workspaces, find the production flow, and work out a way to fit the entire production line into half its original space.

The Student-on-Demand program is just one of the services offered by IES, the first program of its kind in the United States. After 50 years of helping North Carolina industries grow and prosper, its goal is to provide \$1 billion in economic impact to North Carolina in four years as part of the 1B4NC campaign.

"IES is out there to bolster the economy of the state," Snead said. "And working with them, you see how you can impact your state, you can see the changes that come about because of the work you've done." ■

## Volunteer opportunities

**This is your chance to make a difference in the lives of future NC State engineers or newly graduated ones. Groups and individuals who benefit from volunteer efforts include Admissions, the Career Center, Alumni Relations, engineering student organizations and current and future students.**

**To learn more about these opportunities, visit [www.engr.ncsu.edu/ncsf/forms/volunteer.php](http://www.engr.ncsu.edu/ncsf/forms/volunteer.php)**

# Reaching out

The Minority Engineering Programs are boosting diversity among engineers.

Start early.

That's how the Minority Engineering Programs at NC State are getting more minority students interested in engineering.

The programs focus on African-American, Native American and Hispanic students—groups that have been designated by the federal government as underrepresented in engineering. Through a range of programs beginning before students enroll in the College, MEP helps these students succeed.

“We expose them to things that they are not likely to get any place else,” said Tony Mitchell, assistant dean and MEP director.

Those efforts are working. For the past five years, NC State has ranked in the top four nationally for the number of engineering bachelor's degrees awarded to African-Americans. The College ranked in the top six nationally for the number of Native Americans receiving those degrees during that same period. Both sets of rankings were published by *Diverse Issues in Higher Education*.

The College reaches out early by inviting newly accepted minority students to spend a night on campus. This immersion program helps prospects learn more about the life of an NC State engineering student.

Students who end up choosing NC State can attend the Summer Transition Program, a six-week program of math, chemistry and computing courses that helps students get acclimated to life on campus. Students who successfully complete the program and enroll in the College receive a small recruiting incentive.



Above: Newly admitted students dined on chicken and barbecue during an overnight recruitment event in March.  
Below: Students participating in the 2008 Summer Transition Program took classes and got acclimated to life on campus.

When the school year begins, many minority freshmen enroll in a two-course sequence that prepares them for the college workload and their professional careers. The fall semester course focuses on time management and adjusting to college life, among other topics. The spring semester prepares students for an engineering career. Students hear from industry representatives and practice interviewing.

By getting minority engineering students on the right track early, Mitchell says the programs help prepare them for successful engineering careers.

“All of our programs are intended to successfully recruit, retain, graduate and place into jobs our underrepresented minority populations,” he said. ■

# FACULTY spotlight

## Grant named Associate Dean for Faculty Development



Dr. Christine S. Grant

Dr. Christine Grant, professor of chemical and biomolecular engineering, has been appointed associate dean for faculty development and special initiatives.

The new position was created to provide support for faculty in the College. The goal is to create an enhanced faculty community that will foster easy, identifiable and productive

collaborations in teaching, research, extension and service.

Grant's research focuses on surface and interfacial phenomena related to the areas of biomaterials, electronic materials and polymer thin films. She is widely recognized as a leader in mentoring and has received numerous top honors, including an NSF Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring. She was among the first to be selected as a Boeing Senior Fellow of the National Academy of Engineering's Center for the Advancement of Scholarship on Engineering Education.

She is the founder and director of the Promoting Underrepresented Presence On Science and Engineering Faculties (PURPOSE) Institute, an organization dedicated to increasing the number and success of engineering faculty members from underrepresented groups.

Grant joined the NC State faculty in 1989, becoming the first African-American woman faculty member in the College.

## DeSimone awarded \$500,000 Lemelson-MIT Prize



Dr. Joseph M. DeSimone

Dr. Joseph M. DeSimone, William R. Kenan Jr. Distinguished Professor of Chemical Engineering at NC State and Chancellor's Eminent Professor of Chemistry at the University of North Carolina at Chapel Hill, is the winner of this year's \$500,000 Lemelson-MIT Prize for his pioneering inventions, entrepreneurial success and commitment to mentorship.

The \$500,000 prize—sometimes called the “Oscar for inventors”—is handed out by the Lemelson-MIT Program, which recognizes outstanding inventors for their contributions to society. DeSimone accepted the prize in June.

DeSimone's inventions include a breakthrough manufacturing process in which supercritical carbon dioxide is substituted for a potentially harmful acid to produce a class of high-performance plastics called fluoropolymers. He also helped develop technology for a fully bioabsorbable, polymer-based stent. DeSimone's PRINT (Particle Replication in Non-wetting Templates) technology makes tiny, controllable engineered particles that can diagnose and treat disease.

The researcher was also recognized for his commitment to education, having mentored more than 130 students and research associates.

DeSimone joined the NC State faculty in 1994 and the UNC-Chapel Hill faculty in 1990.

## Hunt receives national extension award



Dr. William F. Hunt III

Dr. William F. Hunt III, assistant professor and extension specialist in the Department of Biological and Agricultural Engineering, has received the 2008 Nolan Mitchell Young Extension Worker Award from the American Society of Agricultural and Biological Engineers.

The award, named in honor of crop-drying pioneer Nolan Mitchell, recognizes outstanding

success in motivating people to acquire knowledge, skills and understanding to improve agricultural operation. Hunt was recognized for his exemplary leadership and outstanding contributions as a researcher, educator and extension specialist.

Hunt oversees the Stormwater Engineering Group at NC State, one of the largest stormwater applied research programs in the U.S. He has established partnerships with state agencies, local governments and the private sector and has provided leadership in attracting more than \$3 million in external support for his research programs.

Hunt has authored or co-authored more than 85 peer-reviewed extension publications, media articles and other publications. He has conducted more than 100 workshops, training sessions and field tours across North Carolina and other states.

Hunt holds three degrees from NC State, including a master's in biological and agricultural engineering. He received his Ph.D. from Pennsylvania State University in 2003.

## Miller honored with national distance learning award



Dr. Thomas K. Miller III

Dr. Tom Miller, vice provost for Distance Education and Learning Technology Applications (DELTA) and associate dean of engineering, was honored by the United States Distance Learning Association (USDLA) with its award for Outstanding Leadership by an Individual in the field of Distance Learning.

The USDLA Awards were created to acknowledge major accomplishments in distance learning and to highlight those distance learning instructors, programs and professionals who have achieved and demonstrated extraordinary results through the use of online, videoconferencing, satellite and blended learning delivery technologies. Miller had previously received the state award from the North Carolina Distance Learning Association.

In his role as vice provost for DELTA, Miller is responsible for strategy, deployment and implementation of the university's learning technologies and distance education programs. He is a member of the Academy of Outstanding Teachers at NC State and received the 1995 Joseph M. Biedenbach Outstanding Engineering Educator award from the Institute of Electrical and Electronics Engineers.

A professor in the Department of Electrical and Computer Engineering, Miller joined the NC State faculty in 1982. He is the founder and director of the Engineering Entrepreneurs Program at NC State.

# NC State Engineering At A Glance

- 18 bachelor's, 17 master's and 13 doctoral programs on campus
- 12 academic departments
- 10 online engineering master's degree programs—designated No.1 “Best Buy” by GetEducated.com
- 170 distance education courses offered each year
- 11 National Academy of Engineering members
- 77 recipients of Presidential and National Science Foundation recognitions for achievement, including 54 NSF Career Awards, 3 Presidential Mentoring Awards and 1 National Medal of Technology
- 1 Emmy Award
- Nobel Peace Prize winner Industrial Engineering alumnus, Dr. Rajendra Pachauri
- 25th in Academic Ranking of World Universities in engineering and technology
- 16th in *U.S. News & World Report* undergraduate rankings of public colleges of engineering whose highest degree is a doctorate, 28th overall
- 19th among public colleges of engineering in *U.S. News & World Report* rankings of graduate engineering programs, 30th overall
- 4 departments ranked among the top 20 in *U.S. News & World Report* rankings of undergraduate programs
- 4th largest undergraduate enrollment in the US\*
- 11th largest graduate enrollment in the US\*
- 6th in BS degrees awarded in the US\*
- 18th in MS degrees awarded in the US\*
- 17th in PhD degrees awarded in the US\*
- 3rd in BS degrees awarded to African-Americans among non-HBCUs\*
- 4th in number of African-American tenured/tenure-track faculty among non-HBCUs\*



- 11th in BS degrees awarded to women\*
- 11th in number of women tenured/tenure-track faculty\*
- 4th in chemical engineering degrees awarded\*
- 7th in civil engineering degrees awarded\*
- 4th in electrical engineering degrees awarded\*
- 1st in computer engineering degrees awarded\*
- 9th in computer science degrees awarded\*
- 11th in mechanical engineering degrees awarded\*
- Annually engages in statewide outreach to more than 5,000 students and 500 teachers in K-12 programs, supported by more than \$2 million in grants for science, technology and mathematics education
- First academic Playstation 3 computing cluster created
- Built and operated the world's first nuclear reactor used for teaching, research and public service

\* *ASEE 2007 Data*

# NC State's College of Engineering Celebrates Banner Year

The College of Engineering has enjoyed a banner year. Enrollment continues to grow with more than 8,000 undergraduate, graduate and distance education students enrolled for the fall 2008 semester. The College moved up four places in the *U.S. News & World Report* graduate rankings and now ranks 19th among public engineering colleges and 30th overall. The Academic Ranking of World Universities ranks the College 25th in the world. In the most recent *U.S. News* undergraduate rankings, the College is 16th among public colleges of engineering whose highest degree is a doctorate.

According to recent data from the American Society for Engineering Education (ASEE), the College ranks 4th in the nation in undergraduate enrollment and 6th in number of bachelor's degrees awarded. Undergraduate enrollment for fall 2008 increased to 5,927. The 2008 freshman class is among the strongest to enter the college with an increase in female students and a 19-point increase in SAT scores.

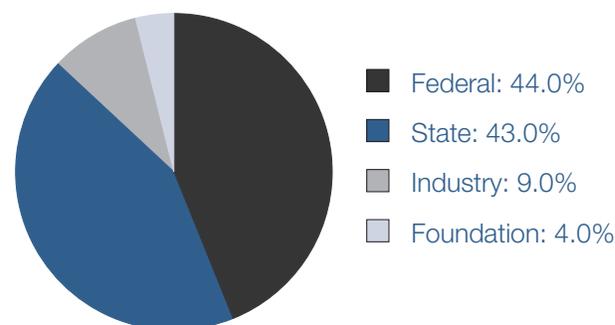
The College ranks 11th in the nation in graduate enrollment, with 2,125 graduate students enrolled in 2007–08, according to recent ASEE data. The number of Ph.D. graduates increased from 119 in 2006 to 138 in 2007. For fall 2008, graduate enrollment increased to more than 2,220. The Engineering Online distance education program added two new online master's degree offerings, bringing the total online master's degrees available to 10. Two more are planned for 2009. GetEducated.com ranked the 10 Engineering Online master's degrees as its No. 1 Best Buy in 2007–08.

Research expenditures also increased to more than \$104 million for 2007–08 and continue to grow. The College ranks 17th in the nation in research expenditures and 14th in industry support, according to ASEE data. The College celebrated the establishment of the NSF Engineering Research Center for Future Renewable Electric Energy Delivery and Management (FREEDM) Systems in September. NC State

is the lead institution on this NSF center and will partner with Arizona State University, Florida A&M University, Florida State University, Missouri University of Science and Technology and two research centers in Europe. The FREEDM center will focus on developing the "Internet for Energy," an innovative smart grid for renewable electric energy delivery and management.

The College broke ground on Engineering Building III in the spring of 2008 and celebrated the placement of the last beam with a "Topping Out" ceremony held in September. This newest addition to NC State's Centennial Campus will house the Joint UNC-NCSU Department of Biomedical Engineering and the Department of Mechanical and Aerospace Engineering. When completed, more than two-thirds of the College will be located on Centennial Campus. The North Carolina General Assembly provided planning and design funding for Engineering Building IV and V, which will house the college administration, the Department of Civil, Construction, and Environmental Engineering, the Edward P. Fitts Department of Industrial and Systems Engineering and the Department of Nuclear Engineering. These new buildings and the move of the College to NC State's Centennial Campus provide for the growth of the College. ■

Research Expenditures 2006–07; \$104.4 Million



# NC State Engineering Foundation Inc.



Engineering Buildings I, II, III



## From the executive director



Ben Hughes

Dear Alumni and Friends,

Just over seven years ago, the NC State College of Engineering launched its part of the university's *Achieve!* Campaign. After very strong early fundraising success, the campaign leadership team, consisting of co-chairs Frank Culberson, Fred N. Day IV and Tom McPherson, worked with staff to adjust our original goal of \$180 million up to \$225 million. While this was a lofty mark to set for

our college, we did so with a confident knowledge of the commitment, pride and generosity of our alumni, friends and corporate partners. The campaign came to a close this past June, and we are excited to report that our closing tally reached \$265.7 million. That's \$40 million more than our adjusted goal!

Naturally, we are very proud of the success as measured in financial support for discovery, learning and innovation in the College of Engineering. We are exceedingly grateful to the NC State Engineering Foundation Board of Directors for driving this success, as well as to all of the donors who pushed the College to meet its highest expectations.

As we look to the College's bright future we are most energized by the impact of that success on the people who make up NC State Engineering—chiefly, the growing numbers of students and faculty whose scholarship and research are bolstered by your generosity.

This is an exciting time of tremendous opportunity for the College. Under the dynamic leadership of Dean Louis Martin-Vega, we are rising in the national and international rankings, our enrollment of undergraduate and graduate students is surging, and we continue to grow the capacity for our students and faculty to work together to forge creative and responsible technological solutions to some of society's greatest challenges.

The College's advance in so many areas means that every day we compete for the highest achieving faculty and students with peer institutions like Georgia Tech, Penn State, Maryland, and others on the national stage. While our successful campaign has positioned us well to take advantage of these opportunities, we still lag behind nearly all of our peer institutions in vital endowment funding, which enables us to compete successfully.

Endowment funding is most needed to support our efforts to recruit and retain faculty, who have the greatest influence on the education that we can provide to our students and are the primary actors in conducting the forward-looking research that has a positive impact on society. As we celebrate the successes of our *Achieve!* Campaign, we offer our sincere thanks to you for helping us build such a strong foundation. We hope that you will continue to express your loyalty to the College and will join us in our continuing efforts to leverage a truly unique convergence of opportunities.

– Ben Hughes  
Executive Director, Development and College Relations

## Volunteers

### NC State Engineering Foundation, Inc. Board of Directors • 2007 – 2008

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Troxler Electronic Laboratories Inc.

Jeffrey R. Garwood CHE '84  
President/CEO  
GE

S. Edward White, EO '78  
Chairman and CEO  
Field2Base Inc.

Donnie L. Goins, EE '85  
COO/President  
Tawe Software Company

Scott Wingo, CPE '92  
President and CEO  
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Berry G. Jenkins Jr., CE '65  
Director, Highway Heavy Division  
Carolinas AGC Inc.

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CE '75, DES '77  
CEO  
Withers & Ravenel Inc.

### Donors • 2007–2008

The College of Engineering and the NC State Engineering Foundation Inc. gratefully acknowledge the generosity of our alumni and friends. Your loyal support is vital to the college and makes a tremendous impact on all facets of university life.

The list of donors can be viewed online at  
[www.engr.ncsu.edu/foundation/donors/](http://www.engr.ncsu.edu/foundation/donors/).

# Achieve! Campaign wraps up with record fundraising total for College



Generous donors contributed \$265.7 million to the College during the *Achieve!* fundraising campaign, exceeding the College's goal by more than \$40 million.

Donors supported research, scholarships, professorships, facilities and other initiatives within the College. The gifts helped NC State exceed its overall goal of \$1 billion for the campaign, the most successful fundraising effort in NC State history.

"We are grateful for this overwhelming show of support from our alumni, corporate partners, friends, faculty and staff," said Dr. Louis A. Martin-Vega, dean of the College of Engineering. "Congratulations to the NC State Engineering Foundation for successfully leading this important effort."

Private support enhances the College's ability to attract and retain the best faculty and students, develop new programs, create and renovate facilities and upgrade equipment. The College reached its \$225 million goal for the seven-year fundraising effort in July 2007, about a year before the end of the campaign.

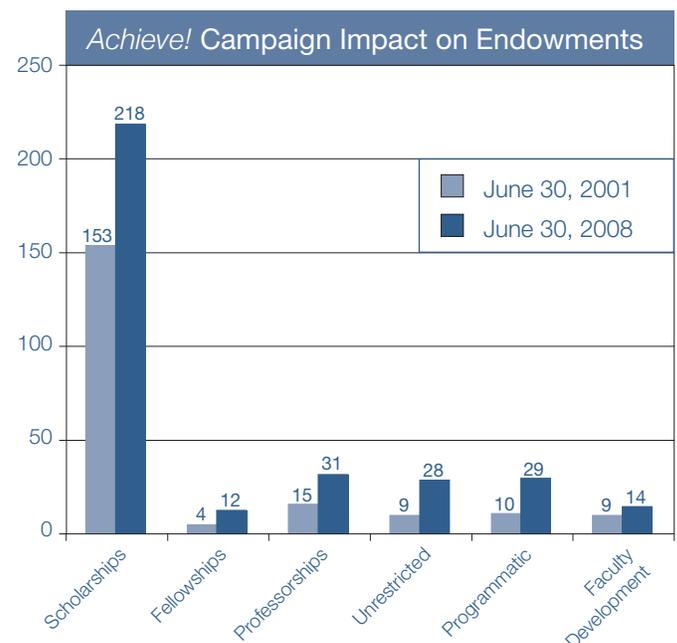
Notable gifts include a \$10 million endowment from Edward P. Fitts to the Department of Industrial and Systems Engineering, which was renamed in his honor. The commitment was the

largest ever received by the College from an individual donor and the largest endowed gift to academics in NC State's history. Fitts is a 1961 graduate of the department.

The College also received more than \$5 million in total gifts from North Carolina's two largest electric utilities, Progress Energy and Duke Energy. The funding supports research, professorships, outreach and other activities.

The College showed its appreciation for the gifts in several ways. The NC State Engineering Foundation's most recent Annual Endowment Dinner, for example, brought together endowment donors with faculty and students who benefited from those gifts; more than 350 people attended. In fall 2007, 100 members of the College's Dean's Circle attended the annual Fall Leadership Dinner. The Dean's Circle honors donors who contribute annual unrestricted gifts of \$1,000 or more.

"We are thrilled that so many people and corporate partners have contributed so generously to this campaign," said Ben Hughes, executive director of the NC State Engineering Foundation. "We are committed to building on this momentum of success so the College will continue to prosper." ■

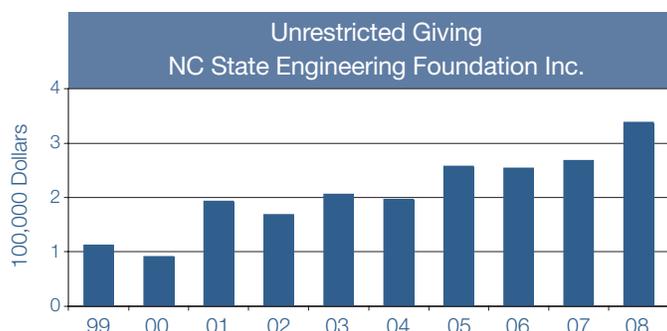


# Foundation Year in Review

Alumni, friends and corporate partners build new opportunities for students, faculty.

The NC State Engineering Foundation closed the *Achieve!* Campaign with a strong year, thanks to the hard work of its staff and the generous support of NC State alumni, friends and corporate partners. Over the course of the 2008 fiscal year, the Engineering Foundation raised more than \$29.5 million in private support for the College of Engineering.

The dollars will have tremendous impact on the experiences of our students and faculty. Through your generosity, we endowed two new graduate fellowships, two new professorships and two new scholarships. The foundation also established five new endowed funds supporting academic programs and three new endowed funds that will generate unrestricted funding, which allows the College flexibility in meeting areas of emerging need. This is an important area as our changing world opens new areas of opportunity. The chart below shows the growth in unrestricted giving to support the College of Engineering. ■



## Dean's Circle memberships

The College saw record growth in Dean's Circle memberships during 2007–08. The number of members grew from 112 to 149, an increase of 33 percent.

**LAMPE SOCIETY**—S. Frank Culberson • Robert L. Dick • Edward P. Fitts • Thomas R. McPherson Jr. • Timothy E. Scronce • Robert G. Wright •

**FADUM SOCIETY**—J. Neil Birch • Larry A. Bowman • John Bratton Jr. • Charles E. Edwards • Jacob T. Hooks • Ross W. Lampe Jr. • Gayle S. Lanier • Robin E. Manning • James M. Robinson • Scot Wingo •

**VAN LEER SOCIETY**—Quint M. Barefoot • Jimmy D. Clark • Otis A. Crowder • Christopher M. Crump • Fred N. Day • William H. Dean • E.O. Ferrell III • Jeffrey R. Garwood • Donnie L. Goins • Michelle L. Hartsell • Samuel G. McCachern • John T. McCarter • Michael J. Means • J. Stuart Phoenix • C. Ed Scott • Kenneth A. Stevens • Willy E. Stewart • Carl S. Stutts • Robert E. Troxler • S. Ed White • J. Turner Whitted • H. E. Withers III •

**DEAN'S SOCIETY**—David C. Ailor • Wilhelmina Allen • John V. Andrews • Stephen F. Angel • Frederick C. Ayers • Ronald J. Baer • Mack W. Bailey • Bruce R. Baldwin • Robert K. Barnhill Sr. • Martin A. Baucom • Richard F. Bean • J. McNair & Laura S. Bell • Gwen Bell • Ashok S. Bhatnagar • Henry M. Boone • Robert G. Braswell • John R. Bratton • Donnie W. Brewer • Randolph D. Broome • John R. Browning • Fred & Judy Brunk • R. A. Bryan Jr. • Robert C. Cagle • N. Ellis Cannady Jr. • Lee Ann Clark • Talmage B. Clements • Steven A. Craig • Thomas G. & Mary Cunningham • H. Lee Davis Jr. • James M. Davis Jr. • W. Alexander Deaton Jr. • Michael A. Ernst • Hugh M. Duncan • Lynn W. Eury • Daniel E. Finch • Alice Forgety & Bruce Clay • Glenn E. Futrell • Howard D. Gage • A. Fred Gant • Andrew M. Goldstein • Larry R. Goode • Richard D. Gould • Leonard & Geraldine Habas • James A. Hackney III • Danny L. Henderson • Edward F. Holt • Ben Hughes • Rodney N. Hutcherson • Berry G. Jenkins • Johnnie H. Jones • Rolf Kaufman • C.S. Keeley • Robert P. Kennel • James F. Kibler • Max A. Koontz • Theodore J. Kratt • George Lai • Charles R. Lambert • Guy L. Lampe • Johnny J. LeBlanc • Peter M. Lehrer • Henry V. Liles Jr. • M. David MacCallum • David Mainella • Louis A. Martin-Vega • Nino A. Masnari • John R. McAdams • Grover C. McNair • Robert E. Meares • Darrell V. Menscer • Christopher P. Meyer • Lester E. Misenheimer • Benjamin Mixon Jr. • Kenneth W. Moody • Barbara H. Mulkey • Larry D. Nixon • Johnny F. Norris Jr. • Francis P. O'Dell • William E. "Jack" Ogburn Jr. • W. Jeffrey Osborne • Roger L. Owens • Donald R. Paul • Tom and Tressa Pearson • Daniel Pietrzak • Steven E. Polge • Charles Randall • Robert C. Rhodes • Jake M. Rudisill • Larry Sanford • P.E. Scarborough • Roger M. Scovil • John M. Simmons • Richard C. Sloan • W. Gilbert Smith • J. Raymond Sparrow • Ervin W. Squires • Kenneth A. Stevens • John E. Titus • W. Parker Tomlinson • Allen K. Tohill • C. Ed Vick Jr. • Jack R. Wagoner • Craig M. Wardlaw • Edward I. Weisiger Sr. • Edward I. Weisiger Jr. • Jennifer Weston • Charles T. Wilson Jr. • Robert S. Wolf • Robert R. Wommack • Edgar S. Woolard Jr. • Simon B. Woolard • James D. Yopp • Deborah B. Young •

## Alumni give campers glimpse of real world



Above: Students at a chemical engineering camp got face-to-face with mini cars powered by fuel cells.

Below: At a materials science and engineering camp, students watched a 30-pound ball of Silly Putty drop from the roof of the D.H. Hill Library. They examined and pulled it apart after impact.

NC State engineering alumni shared their real-world experiences with K-12 students during this year's engineering summer programs.

Alumni now employed by Burt's Bees, John Deere, IBM and other companies were among those who helped out faculty and staff at summer camps and workshops for the hundreds of K-12 students who converged on the NC State campus and other locations across the state this summer.

Among the alumni was Quint Barefoot, who spoke to a chemical engineering camp about the use of engineering applications in product development and entrepreneurial opportunities. Barefoot, a consultant who graduated from NC State in 1985 with a bachelor's degree in chemical engineering, sits on the board of the NC State Engineering Foundation.

"It was a very rewarding experience to see first hand the excitement, creativity and academic talent in the attendees," Barefoot said. "If you want to have renewed faith in the talents of the future applicants at the College of Engineering, just volunteer some time at one of these camps."

The camps gave students a chance to do things they wouldn't normally do on their summer break. Some high-school students designed mini-cars with fuel cells. Others built robots. Still others watched a 30-pound ball of Silly Putty drop from the roof of the D.H. Hill Library; they analyzed its composition after it went splat on the Brickyard.

Younger students benefited from the camps as well, learning how engineers help create everyday consumer goods like cell phones, shampoo and packaged food. Engineers' work, the students learned, is everywhere.

"We're so grateful to all the alumni who helped out at these camps," said Dr. Laura Bottomley, director of K-12 Outreach Programs for the College. "Their experiences help bring engineering to life for these students. We hope they come back next summer!" ■

For more information about the summer programs, visit <http://www.engr.ncsu.edu/summerprograms>.

The west atrium of Engineering Building II, shown at right, will be renamed the Duke Energy Atrium in recognition of the gift, which also includes funds to renovate two conference rooms in the College. Those will also bear the Duke Energy name.



# College receives \$1.25 million gift from Duke Energy

The College of Engineering has received a \$1.25 million endowment gift from the Duke Energy Foundation to support workforce development and teaching and research related to the clean generation and delivery of energy.

The gift will create two named professorships, one each in nuclear engineering and electrical and computer engineering, and will establish an endowed K-12 educational outreach fund to promote the continued development and diversification of the future engineering workforce. These endowments will help produce highly qualified engineers familiar with the core concepts of clean energy generation.

“This generous gift will improve our academic stature, get more young people interested in engineering and accelerate our energy research efforts,” said Dr. Louis A. Martin-Vega, dean of the College. “We are grateful for Duke Energy’s long history of support and their continued interest in engineering education at NC State.”

Duke Energy, based in Charlotte, delivers energy to about four million customers and is one of the nation’s largest electric power companies.

“Duke Energy is proud to support North Carolina State University’s College of Engineering with this gift,” said Ellen Ruff, President of Duke Energy Carolinas. “We are fortunate to have a large number of engineers from NC State working throughout our company, including many in senior management positions. This gift supports both our workforce development strategy and our strong interest in supporting the development of carbon-reduced energy sources. In addition,

we view the College of Engineering as an engine of economic development within our state.”

The endowed professorships—the Duke Energy Distinguished Professor of Nuclear Engineering and the Duke Energy Distinguished Professor of Electrical and Computer Engineering, Power Program—will help the College attract high-achieving research faculty and students in areas of interest to Duke Energy.

The Duke Energy Dynamic and Diverse Engineering Workforce Fund will support collaborations with Duke Energy to expand the College’s efforts to improve math and science education, promote careers in energy-related engineering and improve the diversity of the future engineering workforce. ■

## Contribute to the Dean’s Circle

The Dean’s Circle is the leadership giving society for the College of Engineering. It provides scholarships to recruit incoming students. These scholarship resources allow the College to offer competitive financial aid packages that help highly qualified students attend NC State.

For more information or to make a gift to the Dean’s Circle, visit [www.engr.ncsu.edu/foundation/deanscircle](http://www.engr.ncsu.edu/foundation/deanscircle)

## Alumnus takes over top post in Iraq

Gen. Raymond T. Odierno, an NC State engineering alumnus, has succeeded Gen. David Petraeus as the top U.S. military commander in Iraq. Odierno, who received a master's degree in nuclear engineering from NC State in 1986, had previously been second-in-command in Iraq.

Petraeus left the Iraq position in September to head U.S. Central Command, which oversees the wars in Iraq and Afghanistan.

Odierno received his bachelor's degree from the U.S. Military Academy at West Point in 1976. He also has a master's degree from the Naval War College and is a graduate of the Army War College.

Odierno has served in various roles during his long military career. They include commanding the 4th Infantry Division, the unit that in 2003 captured former Iraqi President Saddam Hussein, and serving at the Pentagon as the assistant to the chairman of the Joint Chiefs of Staff from 2004 to 2006. ■

## ATEC receives state funding

The Advanced Transportation Energy Center (ATEC) at NC State received \$250,000 from the state in the most recent budget passed by the N.C. General Assembly and signed by Gov. Mike Easley.

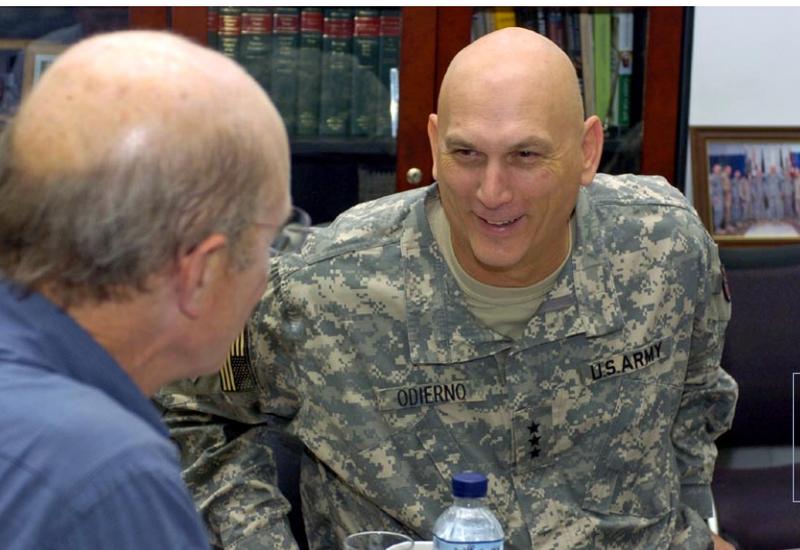
ATEC's creation was announced by Easley earlier this year as a public-private partnership that would draw initial funding from the state and its two major utilities, Progress Energy and Duke Energy. The two energy companies provided a total of \$500,000 for the center's start-up.

The center will work with NC State's new National Science Foundation Engineering Research Center to develop technology that enables widespread adoption of plug-in hybrid vehicles. While traditional hybrids run mostly on a gasoline engine, plug-in hybrids run primarily on electric power stored in a battery. As a result, the vehicles can get more than 100 miles per gallon.

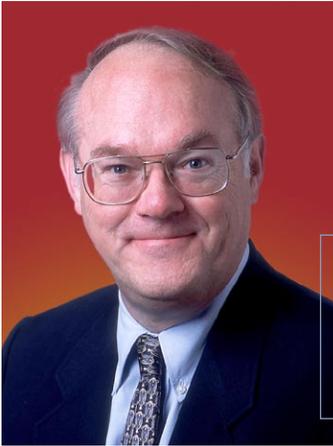
The center will also work on improving battery technology that will enable vehicles to run completely on battery power.

"We are grateful to Gov. Easley and the General Assembly for their support of this important research center," said Dr. Alex Huang, Progress Energy Distinguished Professor in Electrical and Computer Engineering and director of ATEC. "This center will help North Carolina lead the nation in green-energy transportation research." ■

*For more information about ATEC, visit [www.atec.ncsu.edu](http://www.atec.ncsu.edu).*



Gen. Raymond T. Odierno, right, has a master's degree in nuclear engineering from NC State. (Photo courtesy of U.S. Army)



Dr. David W. Johnston is the Edward I. Weisiger Distinguished Professor in Construction Engineering and Management.

# Weisiger professorship shows long history of support

The Edward I. Weisiger Distinguished Professorship in Construction Engineering and Management reflects the Weisiger family's many years of support for NC State.

The professorship was established in 2003 by industrial engineering alumnus Edward I. Weisiger Jr. in honor of his father, Edward I. Weisiger, a longtime supporter who received his bachelor's degree in mechanical engineering at NC State in 1954.

The Weisiger family's roots run deep at NC State. The elder Weisiger's father, Leslie M. Weisiger, did not attend the University but became an enthusiastic supporter of Wolfpack athletics when Edward was in college. The Weisiger-Brown General Athletics Facility is named for Leslie Weisiger.

Edward continued to support the University after he graduated, eventually serving as president of the Wolfpack Club and chairman of the University Board of Trustees, among other positions. In his professional life, he became president of his father's business, Carolina Tractor and Equipment Co. He was named a Distinguished Engineering Alumnus in 1995.

Edward Jr., who graduated from NC State in 1982 with his bachelor's degree in industrial engineering, eventually took over as president and CEO of the family company. He has also stayed involved with the College, serving on the board of directors of the NC State Engineering Foundation. He was named a Distinguished Alumnus by the Edward P. Fitts Department of Industrial and Systems Engineering in 2006.

## What does it take to create a professorship?

Are you someone who wants to leave a legacy and ensure that the College of Engineering can attract and retain the very best faculty members? If so, creating a professorship may be something to consider.

Endowed Professorships provide salary supplements and other resources to attract and retain highly respected scholars. Gifts may be made by cash, securities or land. The minimum to establish an endowed professorship is \$1 million. Gifts may qualify for matching funds from the state. In this case, it would allow a donor or donors to give a gift of \$666,667 and have the state put in \$333,333 to bring the total of the gift to \$1 million.

Endowed Assistant Professorships provide resources to attract or retain exceptional junior faculty with salary supplements and support during their early careers. This is becoming more important in the College as other engineering programs seek to hire away our outstanding junior faculty members. The minimum to establish an endowed assistant professorship is \$500,000.

For more information, contact David Mainella at [david\\_mainella@ncsu.edu](mailto:david_mainella@ncsu.edu) or by telephone at 919.515.9957.

The professorship is held by Dr. David W. Johnston of the Department of Civil, Construction, and Environmental Engineering. His appointment was announced earlier this year.

"This is a tremendous honor for one of our outstanding faculty members," said Dr. Louis A. Martin-Vega, dean of the College of Engineering. "We are grateful to the Weisiger family for their generous and longstanding support of the College." ■

## Angel delivers welcome speech



Steve Angel

NC State engineering alumnus Steve Angel kicked off the Fall 2008 semester by delivering the College's Eighth Annual Welcome address to students.

Angel has been chairman, president and chief executive officer of Praxair, Inc. since 2007. He joined the Fortune 500 company in 2001 as an executive vice president. The company produces, sells and

distributes industrial gases and surface coatings for a variety of industries.

Prior to joining Praxair, Angel was general manager of General Electric's \$2-billion Power Equipment business, directing eight business units and six joint ventures in four countries. Angel joined GE in 1979 and spent 22 years in a wide range of management positions with the company.

A native of Winston-Salem, NC, Angel received a bachelor's degree in civil engineering from NC State in 1977 and a master's degree in business administration from Loyola College.

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## IBM grant to "Jazz" up programming research

NC State is one of five universities from the United States, Canada and Germany to benefit from a \$25,000 research grant from IBM. The grant supports IBM's new collaboration platform called "Jazz," which the company hopes will allow multiple programmers to work closely with one another on projects without being in the same location.

The grant will support NC State research in the departments of Computer Science and Electrical and Computer Engineering to enhance the Jazz platform to include distributed pair programming between members of a team. As part of the project, NC State will also develop an educational environment that is more representative of the collaborative environment found in many sectors of the IT industry today.

The platform takes its name from the idea that multiple programmers working together on a project are like a group of musicians playing in a jazz band.



Willy E. Stewart

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## Stewart gifts benefit students

Willy E. Stewart continues to give back to his alma mater and its students.

Stewart, a native of Colombia, recently established the Stewart Engineering SHPE Student Fund to help support the NC State Society of Hispanic Professional Engineers (SHPE) student

chapter. The funds will be used for student activities and awards. The \$50,000 contribution will be made over five years.

Stewart's company, Stewart Engineering, Inc., recently established the Stewart Engineering Scholarship with a separate gift of \$50,000. These need-based scholarships, which will provide \$2,500 to four in-state students annually for five years, are designed to emphasize diversity among recipients and give first preference to students in the Department of Civil, Construction, and Environmental Engineering.

Stewart received his bachelor's degree in civil engineering-construction in 1981 and a master's degree in civil engineering in 1984, both from NC State.

## About the Engineering Foundation

The NC State Engineering Foundation Inc. (NCSEF) was organized in 1944 by area industrial and business leaders. The purpose of the foundation was to form a tax-exempt, non-profit organization to promote and receive monies to support the College of Engineering at North Carolina State University. The NCSEF is governed by a 32-member Board of Directors, which oversees more than \$53 million in assets. The Board, along with the foundation staff, also works to enhance the image and presence of NC State's College of Engineering.

## Show your support – make a gift to the College of Engineering

Your gift to the College of Engineering at North Carolina State University can support a variety of funds, programs and academic endeavors. These many opportunities to give can be tailored to your needs and interests. Giving to the College is the best way to support scholarships, fellowships, professorships, academic programs, faculty research and areas that are not supported with state funds. The College of Engineering appreciates your interest in its giving programs. If you would like more information, you can visit our website at [www.engr.ncsu.edu/foundation](http://www.engr.ncsu.edu/foundation) or you can contact us:

### **NC State Engineering Foundation Inc.**

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Raleigh, NC 27695-7901

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E-mail: [engr-foundation@ncsu.edu](mailto:engr-foundation@ncsu.edu)

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## Build the NC State Engineering alumni network



The College of Engineering recently created a group on LinkedIn, the professional networking site. LinkedIn is a way to network, ask questions, reconnect with classmates and help other alumni.

We encourage you to join the group and reach out to other NC State engineers. By building a stronger alumni network, we can help each other succeed and help the College of Engineering.

To join the group, please send an email to David Mainella at [david\\_mainella@ncsu.edu](mailto:david_mainella@ncsu.edu) or call 919.515.9957.

A new look online

*The College of Engineering has redesigned its website, and we think you'll like the results.*

Check it out at  
[www.engr.ncsu.edu](http://www.engr.ncsu.edu)



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