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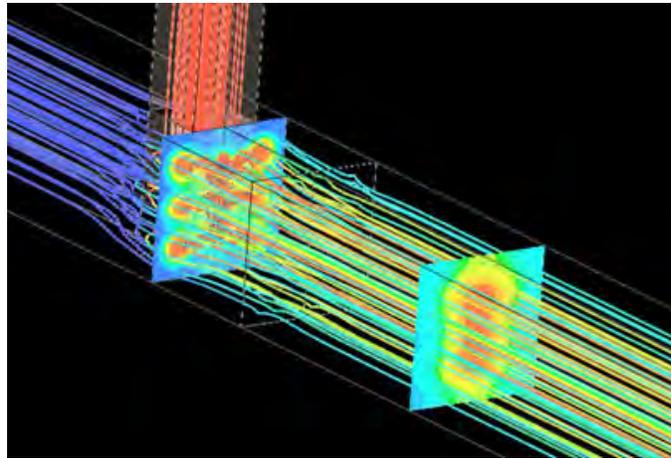
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## A Smart Approach to Fighting Diseases

NC State engineers have invented a new type of inhaler that can target drugs where they are needed, and nowhere else.



Research on the smart inhaler involves mixing drugs in microchannels to obtain a controlled concentration in the smallest device possible. Inhalers have a drug reservoir from which carefully sized particles evolve. They are then delivered toward a pre-determined target in the respiratory system.



Two NC State engineers have developed a new inhaler system that could improve treatments for a host of diseases by targeting drugs onto diseased tissue without affecting healthy areas of the throat and lungs.

The computer-controlled “smart inhaler” could be a breakthrough for patients suffering from lung cancer, asthma, diabetes and other ailments. The prototype device, developed

by Dr. Clement Kleinstreuer, a professor in the Department of Mechanical and Aerospace Engineering, and Dr. Stefan Seelecke, an associate professor in the same department, implements a technology that for the first time tightly controls where inhaled drugs end up in the respiratory system.

The device could eventually result in significant advantages for patients because it focuses drug-aerosol delivery to a specific site in the lungs, minimizes side effects and significantly reduces wasted medicine. It could also signal a breakthrough in drug delivery for diseases that are often treated with pills and injections.

“When undergoing chemotherapy for a lung tumor, a patient is treated with a very aggressive drug that attacks healthy tissue as well as cancerous tissue,” Seelecke said. “You need some device that makes sure the inhaled medication goes where you want it to go, and that’s what we hope this device will help us do in the future.”

The smart inhaler works through the use of a nozzle that can be adjusted to change where the drug-aerosol stream goes in the respiratory system. A pressure actuator and valve inside the inhaler modifies a patient’s breathing pattern so that the released medicine goes where it is needed, and nowhere else.

“When a patient comes in for treatment, we can take a CT scan so you know what the exact geometry of their lungs is,” Seelecke said. “Then we’ll be able to determine patient-specifically where you need to adjust the nozzle to release from.”

Kleinstreuer came up with the idea for the system while conducting research for U.S. Environmental Protection Agency officials who asked him to predict how inhaled toxic particles would deposit in the lungs. He took the research a step further by examining therapeutic materials instead of toxic ones and developed simulations that could determine the exact drug-aerosol release position, particle characteristics and inhalation flow rate to deliver the medicine to a specific site or region in the lungs.

Kleinstreuer and Seelecke used that research to develop the inhaler and conducted laboratory tests on the device with the help of Dr. William Roberts, professor of mechanical and aerospace engineering at NC State. Using a model of twisting glass tubes to mimic the airways from the mouth to the upper branches of the lung and a laser to track the path of the particles, Roberts confirmed the findings of Kleinstreuer’s computer simulations by showing that the air particle stream from the nozzle could travel through the bent and branching airways in the lungs to a specific point.

Earlier inhalers could at best distinguish whether diseased tissue was in the upper or lower region of the lung. With those devices, about 80 percent of the drug was deposited in healthy

areas that did not require treatment, wasting medicine and potentially causing harmful side effects for the patient.

The researchers, with the help of pulmonary specialists at the School of Medicine at the University of North Carolina at Chapel Hill, hope to begin testing the inhaler with patients in about two years. ■

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## From the Dean of Engineering



Louis A. Martin-Vega

Greetings and welcome to our first edition of *NC State Engineering* magazine online. As many of you are aware, the state and the university are facing significant budget challenges as a result of the current economic situation. Developing an online alternative to our printed magazine is one of many ways the College of Engineering is creatively addressing the downturn in the economy. I very much appreciate the great job of our communications group in the College for developing this attractive online alternative and we hope that you will enjoy

it as much or more as our previous printed versions.

Even with the economic storm clouds that were brewing, I am pleased to share with you that 2008-09 proved to be one of the college's most successful years. We not only welcomed a record number of first year students in 2008 but it was also the strongest first year class in our history. With an average GPA of 4.34 and 55 percent of those admitted in the top 10 percent of their high school graduating class, this is truly an outstanding group of young men and women who have entered our College. This influx of undergraduate students combined with continued growth in our graduate and distance education programs has grown our College to 8,304 students, again a record number for total enrollment in the College.

Our faculty has also continued to grow and with the 14 new faculty members we welcomed this year, we have now added 40 new faculty to our College in the last two years. This faculty growth has also spurred an increase in our external contracts and grants as well as our research expenditures which have increased from \$104 million in 2007-08 to a record \$121 million in 2008-09. While there have been many contributions to this growth in research activity, a major contributor has been a five-year \$18.5 million grant from the National Science Foundation to establish the FREEDM Center, an NSF Engineering Research Center for Future Renewable Electric Energy Delivery and Management Systems at NC State. We are very proud of this singular accomplishment and confident that it is but one indication of the ability of our outstanding faculty to successfully compete at the very highest levels of federal funding opportunities.

The articles in this issue illustrate the variety of ways our college impacts the world – from finding better ways to deliver medicines to

building environmentally and structurally sound structures to nurturing the entrepreneurs of the future. You will read about a professor who travels the world improving engineering education and a group of students developing a rover that may some day travel to the moon. And articles on our alumni show how alumni support creates even greater opportunities for achievement among our students and faculty.

The bottom line is that even with the economic challenges that we currently face, we continue to be enthusiastic about the future of research and innovation in the U.S. and welcome our role and responsibility in moving our state and country forward.

The stimulus package recently signed by the President provides significant opportunities for our faculty to obtain research contracts and grants from major government funding units such as the National Science Foundation, the Department of Energy, the Department of Defense, NIST and others. With current research projects in bridge safety, renewable energy, the environment and information technology, the College of Engineering is well-poised to expand our research in the priority funding areas identified in the stimulus package. Our faculty and administration have already begun the process of applying for these funds and we look forward to sharing more of these results as they develop in the future.

At a more local level, we continue to be very proud of the significant role that our College plays in the economic development of our state. During this last year the College has partnered with the NC Department of Commerce to attract a variety of industries to the state, including Spirit Aero Systems, slated to move to the Global Transpark in Kinston. This move will bring more than 1,000 new high-tech jobs to the state. Another effort has assisted with the move of Fidelity Investments to RTP, which cited proximity to a reliable source of skilled computer science graduates as key to their selection of North Carolina. Other key companies that rely on graduates of the College of Engineering include IBM, SAS, Cisco, Red Hat, Progress Energy and Duke Energy. Historically, North Carolina's investments in higher education have supported economic growth within the state. Now, as the economy weakens, investing in the College of Engineering—a known producer of a high-tech workforce and a catalyst for new companies and new jobs—is essential for the state's continued economic success and for long-term prosperity.

The College continues its move to NC State's Centennial Campus as the construction of Engineering Building III, the future home of the departments of Biomedical Engineering and Mechanical and Aerospace Engineering, nears completion. We have also requested funding for design and construction of Engineering Buildings IV and V, the future homes of our departments of Industrial and Systems Engineering, Civil, Construction, and Environmental Engineering, and Nuclear Engineering. These buildings would complete the move of the College to Centennial Campus and clearly enhance our ability to meet the state's needs for a highly educated, technical workforce and for attracting the best jobs and industries to North Carolina.

As you can see, our college is ready to meet the challenges of the future,

and I invite you to be a part of our success. I hope you enjoy this inaugural edition of the *NC State Engineering* magazine online.

Louis A. Martin-Vega  
Dean

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## Dean Martin-Vega Named Outstanding Engineer in NC



*Dr. Louis A. Martin-Vega, dean of the College of Engineering, has helped cement the College's national and international reputation as an elite public engineering school.*

Dr. Louis A. Martin-Vega, dean of the College of Engineering at NC State, was named the Outstanding Engineer in North Carolina for 2008 by the North Carolina Society of Engineers.

Martin-Vega accepted the award Jan. 31 at a banquet in Research Triangle Park. Society President Lynn Eury praised Martin-Vega for his "outstanding executive leadership" in a letter announcing the award.

Since arriving at NC State in 2006, Martin-Vega has helped cement the College's national and international reputation as an elite public engineering school. Under his leadership, the College has attracted more research funding, risen in national rankings and continued to build a diverse and talented group of faculty and students.

The North Carolina Society of Engineers, founded in 1918, is a non-profit, non-partisan, non-sectarian organization that helps promote the social, economic and technical interests of the engineering profession throughout the state.

## Thousands Attend NC State Engineering Career Fair

Thousands of engineering students and hundreds of employers converged on NC State in early February for one of the nation's largest career fairs for engineering students.

The Engineering Career Fair at NC State brought engineering students together with top employers looking to make connections and fill jobs and internships. This year's fair, held Feb. 4-5 at the McKimmon Center on the NC State campus, drew a record 4,530 attendees and coverage from the Raleigh News & Observer and several local television stations. More than 240 companies registered for the event.

The career fair has enjoyed steady growth since its inception in 1998. Originally held as a one-day, once-a-year event that attracted about 60 companies and 1,500 students, the fair has grown into a two-day, twice-a-year event. The fair often draws students from as far away as New York and Texas and has proven popular with job-seeking alumni and other visitors.

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## New concentration to help engineers improve health care system

A new graduate concentration will help NC State engineers improve the nation's growing health care system.

The concentration in health systems engineering was among the new initiatives the Edward P. Fitts Department of Industrial and Systems Engineering set out to install after Fitts, a 1961 graduate of the department, made his landmark \$10 million gift in 2005. Students should be able to start taking courses in the concentration this fall.

Dr. Stephen Roberts, a professor in the department who directs NC State's Laboratory for Healthcare Systems Engineering, said the concentration's curriculum and research will likely focus on health delivery systems, particularly in the field of disease management. Two new faculty members have been hired to build the program, and the department has received several grants, including a \$1.6 million award from the Centers for Disease Control and Prevention that will fund systems engineering research to improve the North Carolina Health Alert Network.

"Health care delivery was once considered to be outside engineering practice, but we hope to change that," Roberts said. "Engineers have no clear role in delivering health care right now, but we believe they must be a part of the deliberations about health care delivery, so that decision and policy makers are better informed."

## College develops mission, vision

The College has developed new [mission](#) and [vision](#) statements to shape its activities in the 21st century. The statements were developed by a committee of College leaders with input from

faculty and staff.

The vision statement sees the College becoming “the leading public college of engineering in the nation and one of the preeminent colleges of engineering in the world.” The College will achieve this goal through research, education, economic development, partnerships and building on its own reputation, among other activities.

The mission statement says the College “leads discovery, learning and innovation by creating and disseminating knowledge, empowering significant advances in technology, and driving economic development for the welfare of the state, the nation and the world.”

The mission is guided by core values and guiding principles that include providing equal educational opportunities for all, insisting on ethical behavior, focusing on students in all activities and valuing leadership, discovery and an open exchange of ideas.

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## Concrete Solutions

Researchers at NC State's Constructed Facilities Laboratory are finding better ways to build that big, ubiquitous structure: the parking garage.



Dr. Sami Rizkalla directs the Constructed Facilities Laboratory, where engineers can perform full-scale tests on bridge and building structures.



People are always looking for ways to make something less expensive, longer lasting or more environmentally friendly – and a team of engineers at NC State is figuring out how to do all of those things at once for some of the largest, most common buildings found anywhere: parking garages.

These advances are important, because parking garages seem to be everywhere. Whenever a new shopping center, office or apartment building is built, you can bet a new garage is being built too. And now those buildings can be made for less money and will last longer.

For example, the researchers have figured out a way to use 30 percent less steel in the manufacture of the concrete beams, or

spandrels, used in the construction of parking garages. Steel is incorporated into the spandrels for reinforcement purposes, but the new design curtails the use of steel without sacrificing safety.

Dr. Sami Rizkalla, one of the leaders of the research team, says the new spandrel design, “simplifies construction for precast concrete producers.” In addition to using less steel, the new design cuts labor and manufacturing time in half, significantly decreasing costs.

The researchers not only come up with new designs, but test them in NC State’s [Constructed Facilities Laboratory](#) (CFL), applying enormous forces on experimental structures to see if the designs can function in the real world. Greg Lucier, the CFL manager and a doctoral student at NC State, says tests at the lab show that the new design guidelines include a significant margin for safety. For example, Lucier says the spandrels could handle two to three times the maximum weight they would be expected to bear.

At the same time, Rizkalla says, his research team is also studying ways to remove steel entirely from precast concrete structures by replacing it with advanced composite materials. Using composites, such as carbon fiber, in place of traditional steel can give parking structures a much longer service life. Lucier explains that the steel reinforcement can actually become the most vulnerable part of a concrete beam over time as it is exposed to water and begins to rust. Thus, designs that rely on advanced composite materials in place of steel could last longer because composites are not susceptible to corrosion.

The success of the research program is drawing interest from the concrete industry, with individual companies coming to NC State to get input on how to improve their products and manufacturing processes. Some are even looking to collaborate on research and development projects.

The researchers presented an overview of their new designs that minimize the use of steel at the spring convention of the American Concrete Institute in San Antonio. ■

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## Pipelines to Innovation

Tom Miller is building entrepreneurs at NC State.



*Dr. Tom Miller (right) and students with the Engineering Entrepreneurs Program visit a technology company during the group's annual trip to Silicon Valley.*



How do you grow entrepreneurship at NC State?

To Dr. Tom Miller, the man tasked with doing just that, it's all about creating pipelines.

Miller, the brainchild behind NC State's successful Engineering Entrepreneurs Program and the executive director of the new NC State Entrepreneurship Initiative, believes nurturing the entrepreneurial spirit in the business creators of tomorrow starts with outreach to students in middle school and high school today. Miller, the McPherson Family Distinguished Professor in Engineering Entrepreneurship, has been on the faculty of the Department of Electrical and Computer Engineering since 1982 and is vice provost for Distance Education and Learning Technology Applications at NC State. He is also an associate dean in the College of Engineering.

Nurturing the entrepreneurial spirit means getting these pre-college students interested in attending college and majoring in science, technology, engineering and mathematics

disciplines, he said. Once these types of students enroll at NC State, Miller's vision is to provide introductory classes in entrepreneurship, maybe even one that satisfies a general education requirement. Then, in Miller's vision, the pipeline would feed students into an entrepreneurship program similar to those that already exist in the colleges of Engineering and Management.

In the Engineering Entrepreneurship Program, for example, multidisciplinary teams of undergraduates run their own virtual companies launching a new product or business. Led by seniors fulfilling their capstone design project requirements, the teams function like start-up companies, divvying up tasks like design, testing, market research, manufacturing and sales.

"Innovation happens at the intersection of disciplines," Miller said. "Multidisciplinary collaboration is the key, because you get minds together that think differently. That leads to innovation.

"Programs like the Engineering Entrepreneurship Program and the College of Management's Entrepreneurship Education Initiative provide the foundation for a successful university-wide entrepreneurship program; now we need to build bridges to other colleges and disciplines."

Further down the pipeline, graduate students in business or technology disciplines can work with NC State's Technology Entrepreneurship Commercialization program (in the College of Management) to learn more about what is needed to turn ideas into businesses. From there, recently minted NC State alumni could take their ideas into the university's technology incubator, where ideas hatch into start-up companies. The incubator has hosted more than two dozen start-up clients.

But that doesn't complete the pipeline, Miller said. Many successful NC State entrepreneurs give something back to the university by providing his or her expertise and savvy to the next generation of entrepreneurs through internship or co-op offerings, or by returning to NC State as a speaker in the university's Entrepreneurship Lecture Series.

The Nov. 3 Entrepreneur Lecture Series starred Joseph Forbes Jr., president and chief operating officer of Cleartricity, a company formed to leverage wireless and wire-line telecom infrastructure towards reducing peak power in the utility power grid. An NC State alumnus with a degree in electrical engineering, Forbes holds three patents and was named to the Triangle Business Journal's list of "40 under 40" area business executives.

Miller and Chancellor James Oblinger laid out NC State's new Entrepreneurship Initiative during the Entrepreneur Lecture Series event. Miller will spend most of his foreseeable career at NC State providing the leadership to bring out the entrepreneur in NC State students and do the other things

necessary to complete the pipeline.

“You can’t teach a person to be an entrepreneur, but you can impact his or her chances for success,” he said. ■

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## Shooting for the moon

NC State engineers are building a rover that could one day run on the moon.



The moon rover built at NC State would explore an area near the moon's "Ocean of Storms." Astronauts with the Apollo 12 mission took this image of the area in 1969. (Photo: courtesy of NASA and the National Space Science Data Center)



NC State engineering students and faculty are playing an important role in a not-so-academic project: building a rover that could actually travel on the surface of the moon.

The group is part of a larger team working to produce a mission to the moon as part of the Google Lunar X Prize competition, which offers \$30 million in prize money to encourage development of privately-funded space exploration. Team STELLAR, as the team is known, is one of 16 teams from around the world vying for the award.

"How many students get to build a rover that might travel on

the moon one day?” said Dr. Andre Mazzoleni, an associate professor of mechanical engineering working on the project. “It’s been a wonderful opportunity for these students to be part of something that could revolutionize space travel.”

The prize represents an important step in the development of privately funded space exploration, an industry commonly referred to as “New Space.” If one of the teams successfully lands a vehicle on the moon, it would be the first privately funded mission to do so.

Mazzoleni and Dr. William Edmonson, professor of electrical and computer engineering, and five graduate students are part of the group’s rover team, which is creating designs for the vehicle that would explore the lunar service. Team STELLAR leaders, meanwhile, are working to raise money to support the project.

Then there’s the prize money. The first team to land a rover on the moon, travel 500 meters over the lunar service and send images and data back to Earth — all by the end of 2012 — receives \$20 million. The second team will receive \$5 million, and another \$5 million in bonus prizes are also available.

The competition is modeled after the \$25,000 that was awarded to Charles Lindberg in 1927 for making the first transatlantic flight.

“The prize intends to one day make space as accessible as overseas flight is today,” said Brandon Nichols, a graduate student in aerospace engineering and rover team member.

Team STELLAR was formed in October 2007 as a partnership between the Department of Mechanical and Aerospace Engineering and several other local organizations, including Insight Technologies and the Advanced Vehicle Research Center. Since then, Mazzoleni, Edmonson and their students have been completing the design for the six-wheeled Earth Demonstrator Vehicle, essentially a prototype rover that will be tested on Earth. After this initial testing phase, the team will build a rover with different materials specifically designed for the stresses of the lunar environment.

The team has already selected a proposed landing zone near the moon’s Ocean of Storms, which has been the site of several significant lunar landings. Among them: the 1969 Apollo 12 mission that was the second manned journey to the moon. The team chose the landing spot so it could take photos of hardware left behind by previous lunar missions. Gathering those photos would gain the team some of the bonus prize money.

But before any launch can take place, much testing remains. In addition to building the Earth Demonstrator Vehicle, the team has also been working with software programs that allow the team to test the rover in a virtual lunar environment, giving

them important insight on how the rover will perform on the moon.

The team estimates that the final rover, which will be known as the “Stellar Eagle,” will weigh around 20 kilograms, or 44 pounds, which has been trimmed down substantially from earlier, heavier designs the team considered. The team said it was important that the vehicle be as light as possible, as each extra pound would increase the cost of getting it to the moon.

All the design, planning and fundraising represent a monumental effort to land a prize awarded to one team competing against many. But NC State team members say the competition is developing an entrepreneurial spirit that could signal a new era in space exploration.

“Space is similar to the West during the gold rush,” Nichols said. “You’re probably not going to see an increase in exploration and development until people realize that there is an opportunity to make money there.” ■

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## Club Sub

A student club builds underwater robots — and the resumes of its members.



DA diver tends to Seawolf II during an international underwater vehicle competition in San Diego, Calif. NC State's Underwater Robotics Club tests its robots against dozens of teams each summer. (Photo: courtesy of the Underwater Robotics Club)



Members of one NC State engineering student group spend a lot of time at the pool.

They're not working on their tans. They're testing their underwater robot.

Every summer since 2005, the NC State Underwater Robotics Club has entered a robot submarine in an international underwater vehicle competition in San Diego, Calif. The event, put on by the Association for Unmanned Systems International (AUVSI), requires each robot to navigate an underwater obstacle course that tests the robot's vision,

acoustics and positioning systems.

Club members work all year to get their robot ready for the competition, but the experience stays with them past graduation. The [club alumni](#) list is peppered with students who have gone on to well-known companies and top-notch graduate programs.

“The club is a great resume builder,” said president Brooks Stephenson, a junior in electrical engineering. “We’ve had former club members go on to get great jobs at places like Lockheed Martin and Northrop Grumman.”

Still, club members have a competitive streak. Members hope to score a top-five finish at this year’s competition, which pits NC State’s robots against those from dozens of universities all over the world. To do that, the club is building a new vehicle that’s lighter and more efficient than its predecessor, which is being retired after three years of service.

The club is primarily affiliated with the Department of Electrical and Computer Engineering, but it also draws mechanical engineering, nuclear engineering and computer science students. Every Monday and Wednesday night, the group gets together in Burlington Labs to hash out ideas, work on design and construction and, eventually, test the robot in campus pools.

“I think people are interested in joining the club because it gives real-life experience and really helps to solidify the things you may have learned in the classroom,” Stephenson said. “It also gives you the chance to learn things that you may see in your classes later on, so you’ll already be familiar with them.”

The club began in 2004 when a small group of friends teamed up with Vortex HC, LLC, a Morrisville-based robotics company, to build a competition vehicle for the following year’s AUVSI event. Their first design, called Seawolf I, suffered some electronic problems and didn’t make the final round, but in practice rounds it turned heads with its acrobatic flips and barrel rolls. It was featured in the magazines *Robot*, *Make* and *Servo*.

The next year, the club began to work on a second vehicle that improved upon Seawolf I. The group gave Seawolf II ([video](#)) simpler controls, a triangular chassis, separate power and electronics tubes, a Windows operating system and streamlined acoustic navigations. Seawolf II served as the competition vehicle for three years; its best showing at AUVSI was a ninth-place finish in 2006.

Seawolf III, which will debut this summer, is under construction now and will employ a highly efficient main computer augmented by a series of microcontrollers. This upgrade makes the new vehicle much lighter than its predecessor and addresses past issues with battery life and

overheating.

The team hopes to have the new vehicle ready by the end of spring to allow time to test it before the mid-summer competition, which requires robots to navigate under, over and through obstacles and use acoustic navigation to find audio beacons in the water. Each robot has 15 minutes to finish the course and is judged on its performance.

For these students, the benefits of club membership are obvious. They make friends, build a dazzling robot and add heft to their resumes. But there's another perk.

"We also get to spend a week out in California during the summer," Stephenson said, "so that's lots of fun." ■

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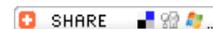
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## First in his (online) class

The first graduate of NC State's Engineering Online program in nuclear engineering is looking ahead.



John Hannah, a radiological engineer at GE Hitachi Nuclear Energy, says the Engineering Online master's program "certainly helped me." (Photo: courtesy of John Hannah)



John Hannah wanted to get a master's degree in nuclear engineering, but he just couldn't find the right program.

So NC State found him.

This spring, Hannah will become the first person to graduate from NC State's Engineering Online program with a master's degree in nuclear engineering. Taking the online classes, which are identical to on-campus courses in terms of content, requirements and academic rigor, meant that he did not have to give up his day job at GE Hitachi Nuclear Energy (GEH) in Wilmington, N.C.

NC State started offering the program after Hannah inquired about it during an information session. Hannah is already benefiting from the technical know-how he's gleaned from the classes, and soon he'll get to add a key line to his resume.

"It's nice that it's available now to other people," Hannah said. "It's certainly helped me."

The recent addition of the nuclear engineering degree means the College now offers 10 master's degrees online. The degrees have been popular with employed students because they can access recorded class lectures any time from any computer that has a high-speed Internet connection. Course assignments, lecture notes and handouts are also made available on the Internet.

"You have the same opportunities that you have on campus, but you get the work experience at the same time," Hannah said.

The Engineering Online program is a great value, too. GetEducated.com recently recognized the program as its No. 1 Best Buy for online engineering degrees nationwide.

Hannah, 25, learned about NC State's program a few years ago after he started thinking about returning to school for a master's degree. There were not any big engineering schools near Wilmington, where he was working at GEH as part of the Edison Engineering Development Program, so he started looking at online degrees.

Around that time, Dr. Linda Krute, director of the Engineering Online program, held an information session for Hannah and others in the Edison program in Wilmington. NC State did not offer a distance-education master's degree in nuclear engineering at that time, but when Hannah and others asked about adding it, Krute liked the idea. She then approached NC State's Department of Nuclear Engineering, which strongly endorsed the development of an online master of nuclear engineering program for the GEH employees in Wilmington. (Now, others can also participate in this degree program from any site or location.)

A few months later, Krute called Hannah to tell him that NC State would start offering nuclear engineering classes online.

Hannah enrolled in fall 2007 and already is seeing the results. On several occasions, he said, he's applied what he's learned in class at his current job as a radiological engineer at GEH.

He also has enjoyed the online format, which makes it simple to view lectures and course materials. While online, he can easily communicate with the professors and other students.

"Even though you can't raise your hand, you do get that interaction," he said.

Hannah views his degree as a building block for the rest of his engineering career. He is thankful that when he asked for something, Engineering Online at NC State responded.

"It's nice that they were able to recognize that students could benefit from something like this," he said. ■

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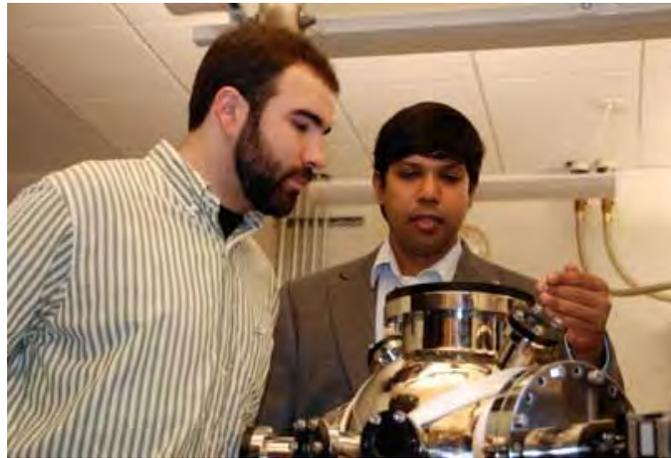
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## Engineering a medical breakthrough

NC State researchers have developed a new nanomaterial that could lead to advanced new medical implants.



Dr. Roger Narayan, right, and graduate student Shaun Gittard look into an ultra high vacuum chamber, which is used to modify the surface of nanoporous membranes.



A team of researchers led by [Dr. Roger Narayan](#), associate professor in the joint [NC State-UNC Department of Biomedical Engineering](#), has made a breakthrough that could lead to new dialysis devices and a host of other revolutionary medical implants.

The researchers have found that the unique properties of a new material can be used to create new devices that can be implanted into the human body – including blood glucose sensors for diabetics and artificial hemo-dialysis membranes that can scrub impurities from the blood.

Researchers have long sought to develop medical devices that could be implanted into patients for a variety of purposes, such as monitoring glucose levels in diabetic patients.

“The idea is that you have an entirely implantable device that performs blood-glucose sensing and delivers insulin over a long period of time — several months or even years,” Narayan said. “And this has kind of been the holy grail for treatment of diabetes with synthetic materials.”

However, existing materials present significant problems. For example, devices need to be made of a material that prevents the body’s proteins from building up on sensors and preventing them from working properly. And any implanted device also needs to avoid provoking an inflammatory response from the body that would result in the body’s walling off the device or rejecting it completely.

Narayan’s research found that nanoporous ceramic membranes may be used to resolve these issues. The membranes, he said, could be used to “create an interface between human tissues and medical devices that is free of protein buildup.”

The new research, published in a special issue of *Biomedical Materials*, is the first in-depth study of the biological and physical properties of the membranes. The study suggests that the human body will not reject the nanoporous ceramic membrane.

Narayan added that this could be a major advance for the development of kidney dialysis membranes and other medical devices whose development has been stalled by poor compatibility with human tissues. Narayan was also the lead researcher on the team that first developed these new materials.

“There is a moral imperative to rehabilitate those who traditionally have had low quality of life due to organ failure, disease, and trauma,” Narayan said. “This research has the potential to help millions of people suffering from chronic medical conditions.”

Narayan’s co-authors on the paper include NC State materials science and engineering doctoral students Ravi Aggarwal and Wei Wei; NC State postdoctoral research associate Dr. Chunming Jin; Dr. Nancy Monteiro-Riviere, professor of investigative dermatology and toxicology at NC State’s College of Veterinary Medicine and the Center for Chemical Toxicology Research and Pharmacokinetics; and Rene Crombez and Dr. Weidian Shen of Eastern Michigan University. ■

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## Traveling Man

Through his innovative teaching workshops, Richard Felder is improving engineering education around the world.



*Dr. Richard Felder and his wife, Dr. Rebecca Brent, have given professional-development workshops to engineering and science faculty all over the world. The locations are plotted on this [map](#).*



Dr. Richard Felder didn't look tired. But he should have.

He was back in his Centennial Campus office a day after completing a 28-hour journey that hop-scotched from Bangkok to Tokyo to New York to Raleigh. Felder and his wife, Dr. Rebecca Brent, had been leading one of their engineering education sessions in Thailand, part of an international "workshopping" schedule that keeps them on the road about 85 days per year.

"It leaves us a little bit of time to come back and do our laundry between trips," he said with a grin.

Felder, a venerable figure in chemical engineering who co-authored one of the field's seminal textbooks, has spent more than two decades improving the way colleges and universities teach engineering and science. His efforts to encourage professors to understand different learning styles

and engage students in class — a teaching model called “active learning” — have influenced thousands of instructors around the world.

“College teaching is the only skilled profession that no one trains you for,” said Felder, the Hoechst Celanese Professor Emeritus of Chemical Engineering at NC State. “You’re not given five seconds on how do you do this before they throw you in front of the students in the class.”

Felder and Brent’s whirlwind workshop schedule has taken them to six continents and all but a handful of U.S. states. Participants everywhere tend to rate them highly — 80 percent give the sessions a rating of “Excellent” — and no matter where the workshops are held, the instructors find the same enthusiasm and curiosity from groups of very different people.

“There are cultural differences, sure, but in general it’s the same stuff everywhere,” Felder said. “We’re getting the same questions, the same interest, the same problems that they’re raising.”

Felder didn’t set out to be a pioneer in engineering education. When he began teaching at NC State in 1969, he was teaching the same way he was taught, and the same way his peers were teaching their students. He filled his classes with long, detailed lectures that provided plenty of fodder for good note-takers. He received high marks from students and won a teaching award his first year.

His success extended to the publishing world with the release of “Elementary Principles of Chemical Processes,” a chemical engineering textbook he co-wrote with fellow professor Ronald Rousseau. The book was a hit with chemical engineering faculty, he said, and it has since been translated into several different languages and been used as the introductory chemical engineering text by roughly 90 percent of American universities. (The book was named to the list of “Groundbreaking Chemical Engineering Books” by the American Institute of Chemical Engineers in 2008.)

But even with all that success, Felder had a nagging feeling that he was letting his students down in class. He was solving the problems his students should have been solving, so the students weren’t really learning. He turned to the education literature for answers.

“We actually know a whole lot about learning and what makes it happen,” he said. “And it wasn’t what I was doing and it wasn’t what my colleagues were doing.”

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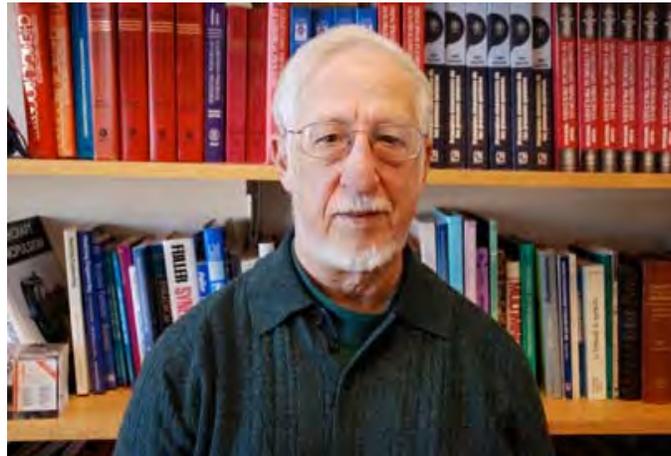
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*Felder is also the co-author of "Elementary Principles of Chemical Processes," one of chemical engineering's seminal textbooks.*

What he found changed the way he taught. Instead of holding forth with long lectures, he broke his classes into short snippets in which students solved problems in groups. Some students understood the information right away. Others took a little longer, but they eventually found the answer themselves — rather than Felder finding it for them.

"You remember about 10 times more of what you say and do than what you see and hear," he said.

Felder began sharing his methods at professional society conferences and in education journal articles and soon began to get some attention. In 1986, he held a workshop for NC State engineering faculty that incorporated what he'd learned. The workshop was so well-received that he was asked to give it again the following year. Soon, faculty at other universities began to take notice of his articles, and before long he was getting invitations to conduct workshops at campuses around the country.

A significant turning point came in 1990 when he married Brent, who had been an education professor at East Carolina University, and they started doing their workshops together.

She brought to the sessions a deep knowledge of pedagogy, and he had the technical background to translate that knowledge into examples that engineers and scientists could relate to.

In 1991, Felder helped start the National Effective Teaching Institute, a three-day workshop held just prior to the annual meeting of the American Society for Engineering Education. The high-profile event has drawn nearly 1,000 participants over the years, and demand for Felder and Brent's services has grown as a result of those sessions.

The domestic interest in the workshops has stayed steady over the years, but international requests have “gone through the roof” over the last five years, Felder said. Now the couple schedule international workshops one or two years in advance.

Despite all the travel, the rewards are huge. In May 2008, for example, Felder and Brent gave a workshop for 100 engineering faculty in India. The faculty came from the second tier of Indian engineering schools, many of which struggle to put out the high-quality engineers needed to support a fast-growing country with 1.1 billion people. After Felder and Brent returned home, they started hearing from faculty members who were trying their methods with great success. Some of those faculty are passing those methods along to their peers.

“We're seeing more of a tangible effect from our India workshop than from anything else we've ever done,” he said.

Felder acknowledges that he has pursued an unconventional academic career path, and he continues to be grateful to the NC State administrators who encouraged him to take it years ago.

“Most department heads and deans would have told me to stick to my research and forget about this education stuff,” he said. “But people like my first department head, Jim Ferrell, and former deans Larry Monteith and Nino Masnari encouraged and supported me. Those guys deserve a lot of the credit for whatever Rebecca and I have contributed to improving engineering education.” ■

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Dr. Denton

## Denton receives NSF Career Award

Dr. Brian Denton, assistant professor in the Edward P. Fitts Department of Industrial and Systems Engineering at NC State, has received a Faculty Early Career Development Award from the National Science Foundation (NSF), effective Jan. 1, 2009. The award, known as the NSF Career Award, is one of the highest honors given by NSF to young faculty in science and engineering.

NSF will provide \$400,000 in funding over a five-year period to support Denton's research project entitled, "Optimization of Screening and Treatment Delivery Systems for Chronic Diseases."

The project involves the development of new operations research models and methods to advance the science of health care delivery for life-threatening chronic diseases such as cancer, diabetes and cardiovascular disease. The goal is to advance the understanding of chronic care delivery, which could improve the quality of life for an increasingly large proportion of the U.S. population. The results of the research have the potential of improving the efficiency and effectiveness of national screening and treatment policies.

Denton received his Ph.D. in management science from McMaster University in 2001 and joined the College of Engineering faculty in August 2007.



## Gubbins receives R.J. Reynolds award

Dr. Keith E. Gubbins, the W.H. Clark Distinguished University Professor in the Department of Chemical and Biomolecular Engineering at North Carolina State University, is the 24th recipient of the R.J. Reynolds Tobacco Company Award for Excellence in Teaching, Research and Extension.

*Dr. Gubbins*

The Nov. 5 awards presentation on Centennial Campus was followed by Gubbins' lecture, "Molecular Modeling of Matter: Impact and Prospects in Engineering."

The R. J. Reynolds award was established in 1981 by the College of Engineering to honor members of the engineering faculty who excel in several areas of activity that relate to the University's three-fold mission of teaching, research and extension. The annual award is supported by the R.J. Reynolds Tobacco Company through the North Carolina Engineering Foundation Inc. Winners receive a \$25,000 prize distributed over five years.

Gubbins received his bachelor's degree in chemistry in 1958 and his Ph.D. in chemical engineering in 1962, both from the University of London. He joined the faculty at NC State in 1998.

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Dr. Antón



Dr. Williams

**Antón and Williams  
articles among “Most  
Cited”**

Papers written by Dr. Annie Antón, professor of computer science at NC State, and Dr. Laurie Williams, associate professor in the same department, were selected by *IEEE Software* as two of the magazine’s 35 “Most Cited Articles.”

The magazine, published by the Institute of Electrical and Electronics Engineers Computer Society, created the compact list of recommended reading as part of its 25th anniversary celebration.

Antón’s paper, “Inquiry-Based Requirements Analysis,” co-authored by Colin Potts and Kenji Takahashi, originally appeared in the magazine in 1994. Williams’ paper, “Strengthening the Case for Pair Programming,” co-authored by Robert R. Kessler, Ward Cunningham, and Ron Jeffries, appeared in the July/August

2000 issue.

Antón received her Ph.D. in computer science from the Georgia Institute of Technology in 1997 and joined NC State faculty in 1998. Williams received her doctoral degree in computer science from the University of Utah in 2000 and joined the NC State faculty later that year.

**Rust named new head of TECS**

Dr. Jon P. Rust is the new head of the Department of Textile Engineering, Chemistry and Science (TECS) at North Carolina State University.



*Dr. Rust*

Rust, a professor of textile engineering, served as associate head of the department for the previous eight years, during which he worked to create strong ties between the university and industry through his multi-disciplinary student internship program. He has led process improvement projects for several different companies and directed the work of more than 100 undergraduate and graduate students on those projects.

In addition to his work with private industry, Rust also maintains a research program in fiber measurement and yarn formation and characterization. His research interests include short staple yarn manufacturing, and his current and upcoming projects include development of novel ginning technology and further development of novel fiber instrumentation for measuring several important cotton fiber properties.

Rust received his bachelor's degree in mechanical engineering in 1982 and his master's degree in fiber science in 1985, both from Clemson University. His doctoral research at NC State was in yarn formation mechanisms; he graduated in 1990.

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The NC State Engineering Foundation, Inc. (NCSEF) works with alumni, friends, corporations and foundations to secure support that is vital for the continued improvement of the College of Engineering. Gifts support scholarships, fellowships, professorships, academic programs, faculty research, and other initiatives that are not typically supported through state appropriations.

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## From the Executive Director



Ben Hughes

Dear Alumni and Friends,

This letter comes to you at a time of financial turmoil and lingering economic uncertainty. The current economic situation seems unprecedented to many of us, and it continues to have an impact on the way we conduct business here at the NC State Engineering Foundation (NCSEF) and throughout the College. This environment, however, must in no way diminish our determination and drive to raise the private support essential to achieving the bold

vision that Dean Louis Martin-Vega has laid out for the College — to become the top public college of engineering in the nation. In fact, the economy places a premium on our development efforts.

The state of North Carolina's historically strong commitment to higher education has positioned the College well. To assure the highest level of return for taxpayers, we need to advance our private fundraising efforts. It is the generosity of alumni, and the strategic investments that corporations and foundations make in the College, that can take us to another level. Private gifts leverage taxpayer support and provide the competitive advantage in our College's drive to achieve the Dean's strategic goals.

When we compare ourselves with those engineering schools that have already attained the highest levels of recognition for their own excellence, we see a common denominator. They all share a history of high levels of private financial support, generated by a culture among their alumni to give back in collective effort to transform the alma

mater. Although philanthropy is newer to the NC State culture, we do have the advantage of a very strong sense of pride, loyalty and commitment among our engineering alumni. Those are the essential ingredients in nurturing a culture of giving back.

One very positive sign of our progress is the current pace of contributions to the Dean's Circle. Despite the economy, we are actually ahead of last fiscal year's mark at this time. We are extremely appreciative of our alumni and friends who have responded so generously to this call in this time of great need. Dean's Circle dollars are used to provide vital scholarship support for prospective students. In the current climate, our immediate top priority is to find a way to continue to extend opportunity to students.

Giving to the endowment remains the preferred long-term philanthropic strategy of our donors and will have the greatest impact on our institutional strength. Our nation's economic history shows that market downturns are transitory — and that times like these prove to be particularly good ones for making long-term investments. Our NCSEF Board of Directors continues to exercise strong fiduciary stewardship through our investment strategy, which will optimize our ability to bounce back.

Please know that we are deeply grateful to all of our alumni who continue to step up in support of the College, our people and our programs in these challenging times. We remain very optimistic about the future of NC State Engineering, especially given the generous level of support our alumni and friends continue to contribute to the College to the best of their abilities during this difficult economy.

Ben Hughes  
Executive Director, Development and College Relations

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## Giving back in trying times

Support from alumni and other private donors can keep the College growing during the economic downturn.



*Gifts from generous donors help the College recruit top students and faculty and fund dynamic engineering education programs for pre-college students.*



With businesses closing, unemployment rising and corporate earnings suffering, it's no surprise that people might think twice before giving away their hard-earned money.

But it's during times like these when the College needs support from private donors more than ever. The College generally receives only about 35 percent of its budget from the state of North Carolina, and with questions about that allotment lingering as the recession continues, private donors are being counted on to keep the College growing.

"Supporting the College is always important, but it's especially vital during difficult economic times," said Ed White, a 1978 graduate in engineering operations who chairs the NC State Engineering Foundation Board of Directors. "Dollars go much further during times like these, and supporters have the chance to make a huge impact on the talented students and faculty who help make NC State one of the nation's best engineering schools."

Many contributors choose to make donations through deferred gifts, generally defined as contributions that cannot be used by the College until a later date. Deferred gifts can be structured in many ways and can help donors build charitable contributions into financial plans.

“The College understands that many donors want to integrate charitable contributions into their overall financial planning objectives,” White said. “By making a deferred gift, donors can maximize the benefits to themselves and to the College.”

Some examples of deferred giving methods:

- **Bequests** are gifts made through a will. They come in several forms, but all involve donating assets to the College following a donor’s death.
- When a donor places a gift into a **charitable remainder annuity trust**, the trust pay a fixed amount of income to the donor or a beneficiary. After the donor dies, the remainder is sent to the College.
- **Charitable remainder unitrusts** work much the same way, except the trust provides variable income based on the market value of the trust’s assets.
- **Charitable gift annuities** provide the donor with a partial tax deduction on the gift as well as a lifetime stream of annual income for the donor or a beneficiary. The College keeps the gift after the donor’s death.

Of course, many donors continue to give now, even as the economy continues to struggle. S. Frank Culberson, a 1960 graduate in chemical engineering, said he would be contributing additional funds to support endowed scholarships that have lost value during the downturn. Culberson’s many gifts to the College include funds for the S. Frank and Doris Culberson Academic Enhancement Fund.

“My goal is to help students get an education,” said Culberson, who is director and chairman of Rimkus Consulting Group. “Throughout my career, I’ve seen the many benefits of getting an education that better qualifies an individual for professional advancement.”

Young alumni can give back, too, even though they may not have the financial resources of longtime supporters. Tyler Schweitzer, a recent nuclear engineering graduate who now works for GE Hitachi Nuclear Energy, noted that giving just a small amount annually can help a top student get a degree.

“If a large group of alumni can contribute at least \$10–\$20 once a year or twice a year, it will go a long way with the College,” Schweitzer said.

Supporters can also give back by volunteering their time. Seth Hudson, a 1999 mechanical engineering and chemistry

graduate who now works as an attorney in Charlotte, organizes a quarterly lunch for NC State alumni in the area. He also gives back financially.

“It definitely makes me feel like I contributed to something,” Hudson said. “I received more from NC State than I could ever hope to give back.”

To learn more about ways to give, please contact Martin Baucom at the NC State Engineering Foundation at (919) 513-3950 or [martin\\_baucom@ncsu.edu](mailto:martin_baucom@ncsu.edu).

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## Building the base

Generous corporate support helped the College strengthen important programs in energy and information technology.



*The Advanced Transportation Energy Center at NC State, which is developing technology for plug-in hybrid electric vehicles, is one of many programs that corporate partners have supported.*



Corporate partners gave the College's energy and information technology efforts huge boosts in 2008, providing support for energy initiatives, professorships and scholarships, outreach efforts and hi-tech equipment.

The gifts from Duke Energy, Progress Energy, IBM, Cisco and other partners further the College's goal of becoming the top public engineering school in the country. The investments help the College attract top faculty and students and support breakthrough technology initiatives such as the Advanced Transportation Energy Center (ATEC) and the Virtual Computing Laboratory (VCL).

"These investments in energy and information technology help us continue to educate the future engineering workforce in areas of critical importance to the economic development of North Carolina and the competitiveness of our nation," said Dr. Louis A. Martin-Vega, dean of the College of Engineering.

“Such generous gifts boost the capacity of our faculty and graduate students to conduct groundbreaking research that will create the kinds of innovation that drive progress.”

The contributions came from a number of longstanding partners who have shaped the College in many ways.

Duke Energy’s support included \$1.25 million to establish professorships in nuclear engineering and in the burgeoning power program in electrical and computer engineering; an endowment to support K-12 outreach efforts around energy; and funds to renovate two engineering conference rooms. The Charlotte-based electric power company has also made a five-year \$1.25 million commitment to ATEC and a gift of \$160,000 in support of scholarships and academic programming.

Progress Energy also provided \$1.25 million to ATEC, which is developing technologies to bring more plug-in hybrid and electric vehicles to American roads. The energy company, which is based in Raleigh, also made a contribution in 2008 that included new funding for scholarships and faculty fellowships in the College’s electric power program, as well as continuing support for the nuclear engineering program. In 2006, the company made a \$1.2 million gift that included funds for professorships in the departments of nuclear and electrical and computer engineering, plus an endowment for unrestricted support for the College.

“We at Progress Energy value our close partnership with the College of Engineering at NC State University,” said Lee Mazzocchi, chief procurement officer at Progress Energy and a 1990 NC State civil engineering graduate. “We employ a large number of engineering graduates from NC State, so the school is an important part of our workforce development strategy. Much of the current research by faculty in the power program will have a direct impact on the evolving future of the utility industry.”

Another longstanding contributor is IBM, the global technology company that donated equipment valued at \$1.2 million in 2007 to the VCL, a groundbreaking initiative that is working to bring cloud computing to universities, community colleges and K-12 schools across the state. In 2008, IBM made \$399,000 in donations that included awards to support research initiatives of our computer science and electrical and computer engineering faculty.

“The research being done by NC State professors is world class and addresses the real-world challenges faced by industry — which in fact represent some of the most theoretically difficult research problems that exist,” said Andy Rindos, head of the RTP Center for Advanced Studies at IBM. “And as we know, these are the same problems that impact the quality of our everyday lives. These awards are therefore proof of the esteem with which IBM regards the NC State faculty.”

Cisco's donation of a TelePresence videoconferencing system to NC State, a gift valued at \$650,000, was part of a larger initiative by the company to link researchers with their counterparts at other universities. The global networking company also provided more than \$128,000 in research awards in 2008.

"We can't thank our corporate partners enough for the recent support they've provided," said Ben Hughes, executive director of the NC State Engineering Foundation. "The College is fortunate to enjoy these longstanding relationships with companies who continue to provide career opportunities for our students, and so recognize the top-notch quality of NC State engineering education and research."

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## Entrepreneurial spirit

Alumnus Tom McPherson talks about starting companies and giving back to his alma mater.



*Tom McPherson, who holds two engineering degrees from NC State, was named a Distinguished Engineering Alumnus in 2004.*



Tom McPherson, an NC State engineering alumnus, likes to start things. He's been a key player for five technology startups, many of which were bought by larger companies.

McPherson is also starting things at NC State. Because of his generous professorship endowment, the UNC Board of Governors has named Dr. Tom Miller as the first recipient of the McPherson Family Distinguished Professorship in Engineering Entrepreneurship. Miller directs the Entrepreneurship Initiative and the Engineering Entrepreneurs Program at NC State.

We caught up with McPherson to ask him about his career, his relationship with NC State, and the importance of giving back.

**You were trained as an electrical engineer at NC State. How did you get involved in entrepreneurship?**

When I left State in 1977, engineering jobs were hot, and I felt that NC State gave me a great start. A company called Digital

Communications Corporation was aggressive and made an offer on the spot. It appealed to me because it was smaller, and it was a great place to work. After about five years, I learned that a fellow NC State grad was starting a company in Palo Alto, Calif., and that's what started this big adventure in entrepreneurship. The first startup didn't make it. The next one, Network Equipment Technologies, went public and is still listed on the New York Stock Exchange today.

**Tell us about Rapid City Communications, one of your greatest entrepreneurial successes.**

Rapid City Communications focused on Gigabit Ethernet technology, and when it started in 1996 some decisions needed to be made about the features of the products. This was a case where some of the technical judgments you have to make about the technology business come from being in the trenches as an engineer. We put a routing feature on the products and the company became successful. Investors had put in \$6 million — and the company sold to Bay Networks for \$155 million after just 14 months. Then Nortel purchased Bay Networks.

**Talk about your relationship with Tom Miller and the Engineering Entrepreneurs Program, and why you created this professorship.**

I met Tom Miller around 2001, and we started talking about what he was trying to do. He was telling students that there's another career path besides working for a large, successful company, and that message really appealed to me. His program obviously helps students become great leaders, but I think it also makes students better followers because they are better positioned to develop startups within companies. The students understand the team nature of doing business and are comfortable with both financial people and engineers. Business schools traditionally do this sort of thing, but his program focuses a little more on the engineers' perspective. That's important because many successful Silicon Valley startups, for example, are run by engineers. I'm a firm believer that Tom's program is distinct, and I thought the professorship would be a good way for me to give back.

**Why is funding for professorships so important?**

Most people don't realize that public universities draw funding from three sources: the tax base, tuition and the private side. For NC State to become the number one public engineering university, it's going to take a significant amount of private involvement. The difference between NC State and our rival universities will probably come down to that.

**You've enjoyed recent success as CEO of Cognio Inc., which was bought by Cisco Systems. What's next?**

That's a good question and I really don't know the answer to

it. You can label me ‘pseudo-retired’ (laughs). Right now I’m playing golf and looking for the next gig. ■

*Thomas R. McPherson Jr. holds bachelor’s and master’s degrees in electrical engineering from NC State. He serves on the Board of Directors for the NC State Engineering Foundation and the Advisory Board for the Engineering Entrepreneurs Program. The College of Engineering named McPherson a Distinguished Engineering Alumnus in 2004.*

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## Staying close and giving back

Through his membership in the Dean's Circle, Steven Craig is among the young alumni helping the College prosper.



Engineering alumnus Steven Craig, a shift supervisor at Progress Energy, is among the youngest members of the Dean's Circle. (Photo: courtesy of Steven Craig)



Steven Craig has been involved with the College of Engineering, one way or another, since he was in high school. He's been a research assistant, undergraduate student, graduate student and volunteer.

He recently added another title: Dean's Circle donor.

Craig, 29, is among the youngest members of the Dean's Circle, a fast-growing cadre of dedicated supporters who make up the College's leadership giving society. Members contribute at least \$1,000 to the College each year, support that provides scholarships to help NC State recruit top students.

In a tough economy, that support is even more important to the College.

"Students might not realize it," Craig said, "but they're relying

on people like the Dean's Circle donors to help the College of Engineering get through this."

Dean's Circle giving has been increasing. In 2007-08, the number of members grew from 112 to 149, an increase of 33 percent. College officials expect a similar increase in 2008-09 as potential supporters learn more about the College's top-flight research and education programs and its growing international reputation.

"It's a competitive environment out there for engineering talent, so having attractive scholarship packages available makes it more likely that NC State will land the top students," said David Mainella, associate executive director of development and alumni relations for the College. "Becoming a Dean's Circle member is one of the best investments a supporter can make."

NC State has been part of Craig's life for more than 15 years. As a high school student growing up in Cary, he knew he wanted to study engineering but was wary of attending college so close to home. But when a high school advisor helped him land a job in NC State's Department of Electrical and Computer Engineering, he took it.

The work wasn't thrilling — he conducted tests on silicon wafers and other microelectronic devices that NC State was developing.

"It was mundane routine work that the Ph.D.s doing their dissertations didn't have to do," he said, laughing. "They had me to do it."

But, he said, conducting research at such a young age helped him prepare for his college engineering courses.

"When you go in as a freshman knowing what the end product will be, it's a lot easier to do the coursework," he said.

While in college, he took an internship with Carolina Power & Light (which became Progress Energy) in downtown Raleigh. The job quickly blossomed into a position that sometimes required 30 hours of work per week, so when he had the opportunity in December 2000 to graduate early and take a full-time job with the company, he took it. He was eventually promoted and transferred to Wilmington, where he moved up through the ranks.

Then, in 2007, Craig attended a "Meet the Dean" event featuring Dr. Louis A. Martin-Vega, the new dean of engineering at NC State. Craig hadn't been involved much with NC State since his graduation in 2000, but just getting the invitation signaled renewed interest by the school. He was impressed with Martin-Vega's presentation and his vision for NC State becoming the top public engineering college in the nation.

“There was something different about how Dr. Martin-Vega came across, and what his mission was and what his focus was,” Craig said.

So, later that year, Craig became a Dean’s Circle member. He’s also giving back by making presentations to students and helping out the E-Council, the college’s student leadership group.

“There are a lot of ways to give,” Craig said. “If your finances aren’t going to allow you to give at a certain level today, then get in front of these students. You start to remember what brought you to NC State in the first place.”

Craig has since returned to Raleigh and now works as a shift supervisor for Progress Energy. His involvement with NC State reached a new level in January when he started taking classes toward a master’s degree in renewable energy.

The degree is being developed as part of NC State’s new FREEDM Systems Center, a National Science Foundation Engineering Research Center working on ways to turn the nation’s power grid into an “Internet for Energy.”

Craig says the center is another way that NC State is building excitement around its engineering programs. That excitement is generating many opportunities for top students and researchers, he said, but those opportunities come with a price.

Through his membership in the Dean’s Circle, he said, “I can help a couple students pay for a semester.” ■

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*C. Richard Vaughn*

## Engineering alumnus among Watauga Medalists

C. Richard Vaughn, an NC State engineering alumnus, has been honored with the prestigious Watauga Medal for his distinguished service to the university.

The 1961 graduate in nuclear engineering, who has twice served on NC State's Board of Trustees, has been a member of the Alumni Association for 25 years and is a member of the W.J. Peele Lifetime Giving Society, which honors donors who have given \$1 million or more to NC State. In 2004 he pledged \$5 million to the Wolfpack Club to fund scholarships and renovations to the football stadium. The Wolfpack Towers were renamed the C. Richard Vaughn Towers in recognition of his generosity.

Vaughn has also given more than \$100,000 to NC State academic funds. He created the C. Richard Vaughn Scholarship Endowment to support an undergraduate scholarship in the College of Engineering. And he funded the renovation of a nuclear engineering laboratory that was named for one of his former professors, Dr. Raymond L. Murray.

Vaughn, of Mount Airy, N.C., is chairman and CEO of the John S. Clark Company, chairman of the North Carolina Granite Corporation and chairman of Riverside Building Supply, Inc. He recently joined the NC State Engineering Foundation Board of Directors.

Established in 1975, The Watauga Medal honors individuals who have made significant contributions to the advancement of the university.



## Roberts named first Allison professor

Thanks to a gift from an alumnus in honor of his uncle, Dr. Stephen D. Roberts has been selected as the first A. Doug Allison Distinguished Professor in Industrial and Systems Engineering.

Roberts directs NC State's Laboratory for Healthcare Systems Engineering and is

*Dr. Stephen D. Roberts*

program director and Fellow with the Cecil G. Sheps Center for Health Services Research at the University of North Carolina at Chapel Hill. He has been a professor of industrial engineering at NC State since 1990 and served as department head from 1990 to 1999.

The endowed professorship was established by Edward P. Fitts to honor Allison, Fitts' uncle who passed away last year. Fitts credits Allison, a 1941 graduate of the College of Textiles at NC State, with inspiring him to pursue a degree in industrial engineering. Fitts graduated from NC State in 1961 and went on to become chairman and CEO of the global packaging company Dopaco.

Fitts' \$10 million gift in 2005 to endow the industrial and systems engineering department remains the largest gift ever received by the College of Engineering from an individual donor and the largest endowed gift to academics in NC State University's history. The department was renamed the Edward P. Fitts Department of Industrial and Systems Engineering in honor of his dedication to the College.

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## Brooks endowment creates student-athlete scholarship

NC State engineering alumnus Robert Lee Brooks has established a scholarship endowment for student-athletes majoring in engineering.

Recipients of funds from the Robert Lee Brooks Scholar/Athlete Endowment will be athletes in revenue producing sports: football, baseball and men's and women's basketball. Brooks made two gifts totaling \$100,000 to establish the scholarship.

Brooks, who graduated from NC State in 1969 with a bachelor's degree in engineering operations, is executive vice president at LS Power Development, LLC, a privately held company with offices in several states that develops, acquires and manages power generation and transmission infrastructure throughout the U.S. He previously held various engineering and management positions of increasing responsibility in the operations, project management, sales and marketing functions within the power generation business unit of Westinghouse Electric Corporation.

Brooks' brother and daughter are also graduates of the College. He has previously endowed two football scholarships through the Wolfpack Club.

## Boeing donation supports student activities, scholarships

The Boeing Company has donated \$45,000 to the College of Engineering at NC State to support summer enrichment activities, an aerospace engineering design program and scholarships for engineering students.

Boeing, the world's largest aircraft manufacturer, has made numerous gifts to the College over the years in support of scholarships, summer programs and student organizations.

The gift will be allocated among several programs, including an aerospace engineering summer camp, the Minority Engineering Programs' summer transition program, the aerospace engineering senior design program and merit scholarships.

## Alumni appreciation

The College thanks all of the alumni who participated in various events and activities over the past several months.

Your help with E-Week, following up with recently accepted students and other efforts help build momentum around the NC State engineering community.

Again, many thanks for all you do for the College.

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