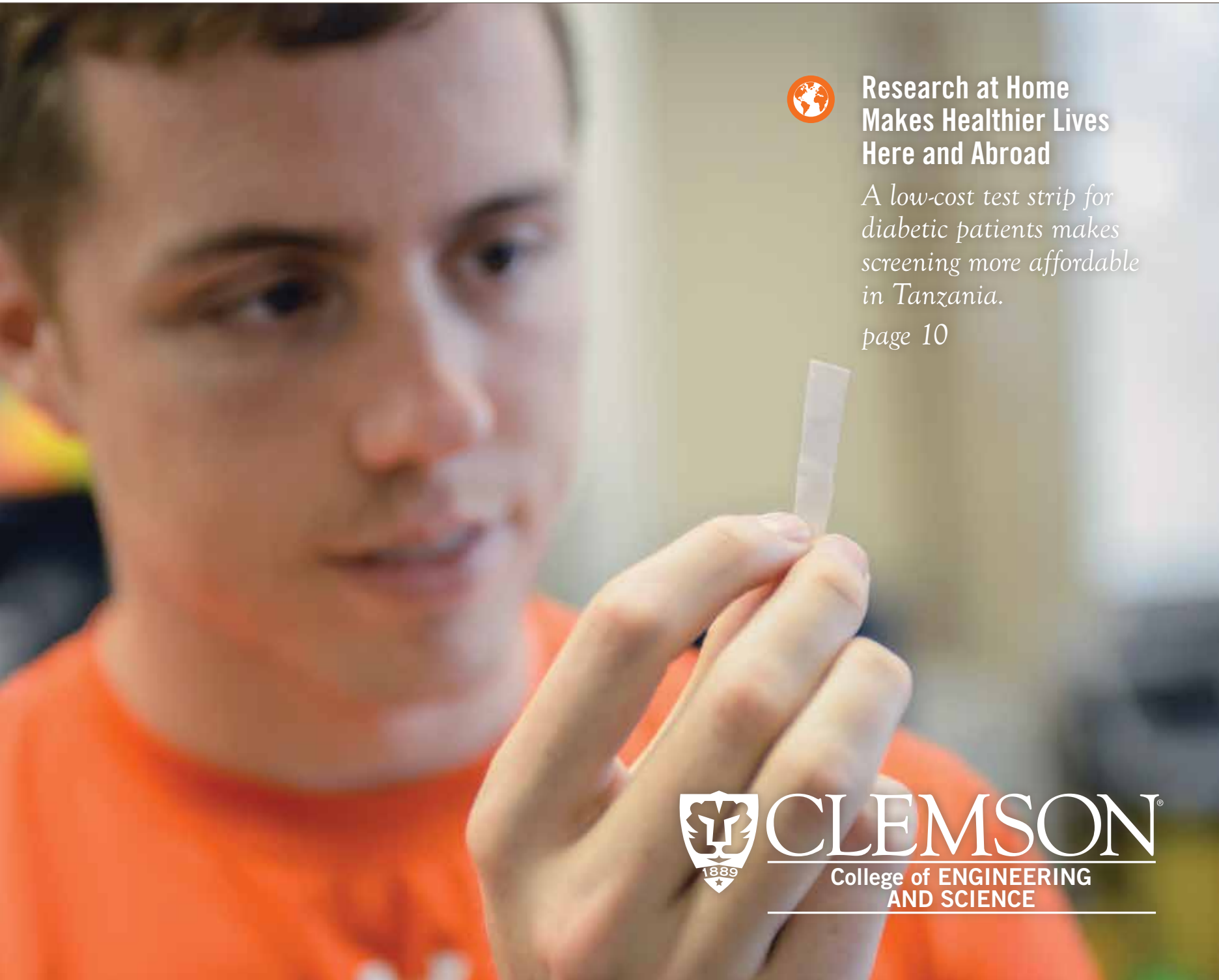
IDEaS

INQUIRY, DISCOVERY IN ENGINEERING AND SCIENCE FALL 2014 COLLEGE OF ENGINEERING AND SCIENCE



Research at Home Makes Healthier Lives Here and Abroad

A low-cost test strip for diabetic patients makes screening more affordable in Tanzania.

page 10

CLEMSON
College of ENGINEERING AND SCIENCE

FROM THE DEAN

Clemson University has become a member of the **National Academy of Engineering's (NAE) Grand Challenge Scholars Community.** Members of this illustrious group are working to equip the next generation of innovators who will solve the grand challenges facing society in the 21st century.

The NAE Grand Challenge Scholars Program has five components: research experience, interdisciplinary curriculum, entrepreneurship, global dimension and service learning.

The program encourages engineering curriculums to overlap with other disciplines, such as business, law and human behavior. It prepares students to **"translate invention to innovation"** and emphasizes the world perspective students will need to succeed in a global society. It seeks to deepen their social consciousness in hopes they will use their technical expertise where it's needed most.

As I read through the description of the Grand Challenge Scholars program, I am reminded of several offerings in the College of Engineering and Science that dovetail with the elements of the program. One of the first that comes to mind is Creative Inquiry, a top-notch Clemson program that helps undergraduates get involved in cross-disciplinary research. Like the Scholars program, these projects generally include community and service learning, entrepreneurship, and global impact. This issue of *IDEaS* features a number of stories about the **translational research** that the college has helped launch.

Clemson Engineers for Developing Countries (CEDC) received a 2014 Andrew Heiskell Award in the study abroad category (see story, page 2). While the recognition is welcomed, the deeper story is how Clemson students designed and helped build a clean-water system for about 10,000 residents of Cange, Haiti, and the surrounding area. The program began in 2009 with students from civil engineering, and now more than 350 students representing 30 majors have been part of the CEDC project.

Another of our Creative Inquiry teams was recognized with a Lemelson-MIT "Cure it!" prize in the undergraduate category for their GlucoSense project (see story, page 10). The prize rewards students for working on technology-based inventions that can improve health care. The work is part of the bioengineering department's broader effort to improve lives in Tanzania. This experience shows our students how their discoveries can make transformative changes in lives everywhere. By doing so, they transform themselves into more global and socially responsible citizens.

On the domestic front, two Clemson University graduate researchers are working on new applications for "connected cars" as automakers begin producing more vehicles that can connect online while on the road (see story, page 6). This duo won two of six categories in the Global Connected Car Contest 2013, sponsored by Chevrolet and German software giant SAP.

We're also very proud of our two 2014 Goldwater Scholars (see story, page 14). Their remarkable work in astrophysics and bioengineering has been balanced with recreational and creative outlets that make them true artists as well as successful scholars and scientists.

The most interesting work in education and research today is happening at a similar intersection of disciplines — a crossroads Clemson's College of Engineering and Science knows well. From this unique position, we are conducting **high-impact translational research** that is capable of transforming lives. Collaboration and innovation are an inherent part of our college by virtue of the relationship shared by science, engineering and mathematics. As a land grant institution, entrepreneurship and societal impact are part of our DNA.

In our newly completed strategic plan focusing on **innovation through translation** we set out four academic priorities: offer world-class facilities; attract virtuoso students, faculty and staff; create exemplary educational experiences for those stakeholders; and provide impactful research and scholarship opportunities. I think that this issue of *IDEaS* illustrates our commitment to these priorities. If you'd like to read more about our strategic plan, there is a link on our college's website at *clemson.edu/ces*.

As always, your thoughts would be most welcome.

Sincerely,
Anand Gramopadhye, Dean

IDEaS

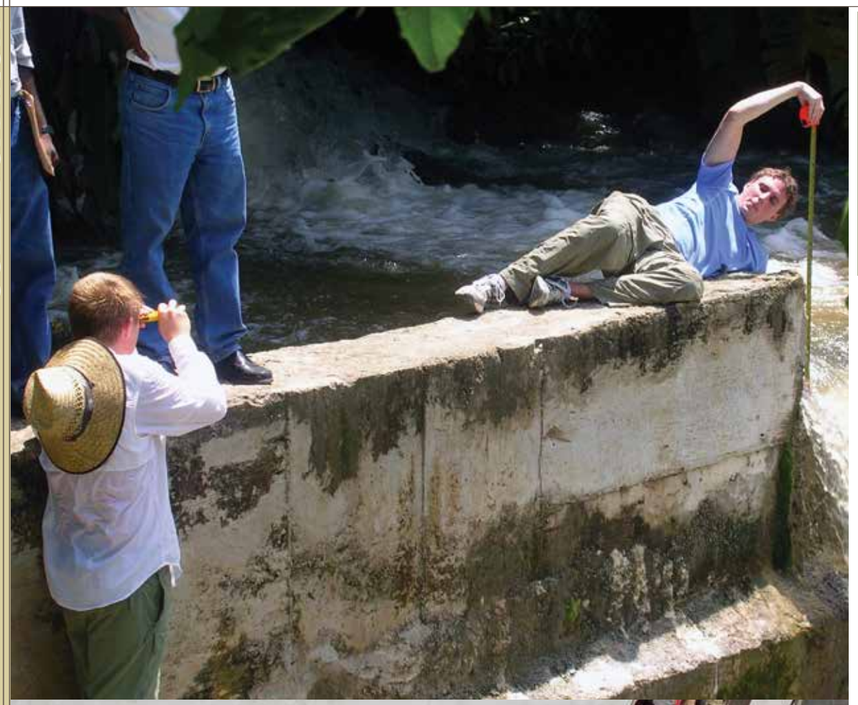
INQUIRY, DISCOVERY IN ENGINEERING AND SCIENCE FALL 2014 COLLEGE OF ENGINEERING AND SCIENCE

CES student and Goldwater award winner Kate Showers (middle, with laptop) has pursued meaningful bioengineering research during her undergraduate career.

page 14

IN THIS ISSUE

CLEMSON
College of ENGINEERING AND SCIENCE



ENGINEERING A SOLUTION

Award-winning Clemson Engineers for Developing Countries program focuses national spotlight on Glenn Department of Civil Engineering

by Paul Alongi

Clemson University graduate student Joshua Mitchell said he ate two meals a day and lived in a hospital-complex dorm while helping build a water system for a remote Haitian village stricken by cholera. While it wasn't the most comfortable time of his life, he had the privilege of watching villagers come to expect something virtually all Americans take for granted: Clean water.

Clemson Engineers for Developing Countries (CEDC) has been recognized as one of the most outstanding international education programs in the United States. The program started by focusing on a single village in Haiti's Central Plateau. On the heels of a major award, it's now preparing for expansion with an ambitious goal.

"We want to eliminate cholera in Haiti," said Dr. James Martin, chairman of Clemson's Glenn Department of Civil Engineering.

For Haitians, the program is life-saving. But it could also have an effect at Clemson, as the Glenn Department of Civil Engineering strives for national recognition in the wake of a big financial boost. The department was named for the Glenn family in 2011 after alumnus Gerald Glenn and his wife, Candice, gave $5 million. The gift made Clemson's civil engineering department one of four nationwide that have been endowed by large donations.

The other three are ranked in the top 10 by *U.S.News & World Report*. Glenn said that with CEDC's help, the Clemson department that bears his family's name could soon join the others.

"It's a differentiator for Clemson," Glenn said. "The program is redefining civil engineering and the way it's taught. It's providing skills beyond the norm in areas I thought were important when I was working — teamwork, communications and leadership."

Anand Gramopadhye, dean of the College of Engineering and Science (CES), said CEDC combines the components that will be key in creating the next generation of engineers.

Those components are research experience, interdisciplinary experience, entrepreneurship, global dimension and service learning. They were drawn from National Academy of Engineering Grand Challenge Scholars Program.

"Students are learning to innovate in difficult conditions and collaborate across disciplines," Gramopadhye said. "They are taking what they learn in the classroom and translating it into a real-world project that is having a high impact on global society."

The system that Clemson students designed and helped build provides clean water for about 10,000 residents of Cange and the surrounding area. It was the first chlorinated municipal water system in Haiti's Central Plateau.

Work in the Western Hemisphere's most impoverished nation started when Jeff Plumblee, who was then a Clemson graduate student, crossed paths with the Episcopal Diocese of Upper South Carolina. The diocese was working to upgrade Cange's 30-year-old water system.

"Students are learning everything from engineering to project management to culture to business to planning. They are, in effect, a small global corporation."

Plumblee and six other civil engineering students began design work on a new system in 2009. A 7.0-magnitude earthquake struck near Port Au Prince a few months later, killing tens of thousands of people. While Cange suffered little damage, the population swelled as earthquake survivors migrated to the region in search of medical treatment.

Then came the cholera epidemic, hitting the Central Plateau particularly hard. The outbreak sickened about 680,000 people, killing more than 8,300 across the country.

"It just made our work even more important," said Plumblee, who now lives in Greenville and works at Fluor Corp., as a business continuity and disaster management specialist.

The lack of sanitation and water filtration in Cange and the surrounding villages enabled the quick spread of cholera, an infectious disease.

Some residents in the most remote villages were too sick to hike through the rough terrain for treatment, said Jennifer Ogle, the associate professor of civil engineering who serves as the program's faculty advisor.

"It's a treatable disease, and a problem that can be eliminated with proper infrastructure, so that's the tragedy," she said.

Students and villagers worked together to finish the water system, installing the third pump in October 2012. The system includes a new dam, a filtration building, six miles of piping, nine fountains, two new cisterns and two reconditioned cisterns — all housing more than 200,000 gallons of water.

The Institute of International Education awarded CEDC a 2014 Andrew Heiskell Award in the "study abroad" category in January. It's one of the top awards in international education. The program has also won praise from Nadim Aziz, now interim provost and former chair of the Glenn Department of Civil Engineering. He said he likes that students have worked to train local Haitians to maintain the water system themselves.

Episcopal Diocese of Upper South Carolina provided $1.5 million for the project. David Vaughn, a director of business continuity and disaster management at Fluor Corp., said he first met with the program's students in December 2009 when he was invited to a meeting with the diocese. The partnership between the diocese and students has continued to grow, he said.

"Students of CEDC are helping design and oversee projects in Haiti which improve engineering and construction standards and offers both cost and schedule certainty," he said. "The local population is seeing improvements in public health, gaining much needed skills and striving for economic development. And most of all, we are seeing a generation of young morally straight students change the world and in turn themselves."

Clemson Engineers for Developing Countries originated with the package of disciplines known as STEM — science, technology, engineering and mathematics, an underrepresented group in international education.

Once started, the program quickly spread to other disciplines, and it now involves 30 majors across the university, said Dr. Barbara Speziale, the director of Creative Inquiry, a Clemson program that sponsors the Haiti work.

CES students served as project engineers and project managers for a water system installation in Haiti.

When engineering students needed someone to write pamphlets, they recruited students who were majoring in English to assist. The project receives funding from multiple sources, so students majoring in finance pitched in to handle the money.

"A project like this lets students see how a project works in the real world," Speziale said. "You need to bring in expertise from many different fields to tackle any problem."

Clemson Engineers for Developing Countries is having the same impact as large organizations but at a fraction of the cost, Martin said. Funds for students to travel, collect data and begin design on the water system were gathered from a number of sources, including student fundraising, private donations and allocations from Creative Inquiry and the Glenn Department of Civil Engineering.

More than 375 students have participated since 2009. Freshmen, sophomores and juniors serve as the project engineers, Martin said. Seniors and graduate students are the project managers, he said.

Martin sees the program as transformational.

"It's the future of education, engineering education in particular," he said. "Students get engaged at a young point in their lives, and they engage their passions. They're in a developing country and they're learning everything from engineering to project management to culture to business to planning. They are, in effect, a small global corporation."

The program has stayed put in Cange for several years, so it has become deeply ingrained in the community and built trust among the locals, Martin said.

Nathan Schneider, now a civil engineering graduate student, said his internship in 2012 was an unforgettable cultural experience. When a worker's wife died, Schneider and other students served as pallbearers in an all-night funeral celebration on a mountainside in the pouring rain. He helped carry the casket down trails and sang Creole hymns.

"It really was neat to be accepted in that way into the community," Schneider said.

The Heiskell award is the second for Uttiyo Raychaudhuri, the director of Clemson's study-abroad program, who won his first while at the University of Georgia.

He sees the Clemson program expanding in Haiti and beyond its borders to other developing countries.

"This will be a Clemson global mission," Raychaudhuri said. "The students are going to lead it. I think this is going to set us apart from other universities." ✻

ON THE APP TRACK

CU-ICAR researchers are taking their connected-car ideas to Silicon Valley with the goal of improving the ease of parking and shopping.

by Paul Alongi

Pablo Sauras-Perez has developed an app that "feeds the meter" for you.

Smart phones and tablets have been able to connect to the Internet for years, but the next-generation mobile device could have four wheels and be parked in your driveway.

Two Clemson University researchers are working on new applications for "connected cars" as automakers begin producing more vehicles that can go online while on the road.

Pablo Sauras-Perez hopes ParkinGain will help drivers find the best parking spots based on their own preferences and allow them to feed the meter without going back to their cars.

Andrea Gil is working on a shopping application, Ready2Pick, that would allow drivers to keep traveling down the road as they order fast-food and groceries from businesses with drive-through service.

While both applications are just beginning to move out of the conceptual phase, they have a good start. Sauras-Perez and Gil submitted their ideas to the Global Connected Car Contest 2013, and they won two of the six categories. The contest is sponsored by Chevrolet and German software giant, SAP.

"It was an international contest with submissions from all over the world," Gil said. "It means we're doing something right."

Winning the contest sets up the Ph.D. students to travel to Palo Alto in Silicon Valley to meet with industry experts and start work on prototypes.

Joachim Taiber, a research professor who guided the students, said the ideas struck the right balance with their business models, market opportunities and technology. The trip to Palo Alto will give Sauras-Perez and Gil an opportunity to introduce their ideas to a larger team, including companies that could turn the concepts into reality, he said.

"I hope they can make some connections to start-up teams that bring this to the next level," Taiber said.

Sauras-Perez is in automotive engineering, while Gil is in electrical engineering. Both are graduate research assistants who do most of their work at Clemson University International Center for Automotive Research (CU-ICAR).

"Andrea and Pablo are off to a terrific start," said Imtiaz Haque, executive director of the Carroll A. Campbell Graduate Engineering Center at CU-ICAR.

"Their apps serve as excellent examples of the high-quality work students are doing at the Campbell Center."

Sauras-Perez said ParkinGain would help drivers find a spot based on location, travel time and how far they would have to walk to their ultimate destination. The application would make parking cheaper, more

convenient and less time-consuming for drivers while increasing business for parking companies, he said.

Once parked, drivers would receive a message when their time is expired and have a chance to renew without going back to a meter to plug quarters into a slot.

Also key to Sauras-Perez's plan is the promise of "dynamic pricing." His hope is that changing the price of parking according to traffic conditions would spread out cars more evenly to keep lanes flowing more smoothly. Sauras-Perez said users would be faced with a choice: "Do I want to pay more to park in front of the place I'm going to? Do I want to pay less and walk five minutes?"

The app could reduce traffic congestion and emissions, Sauras-Perez said. Drivers looking for parking cause an average of 30 percent of downtown traffic in cities, according to Donald Shoup, a professor of urban planning at the University of California, Los Angeles.

"Projects such as these reinforce CU-ICAR's global reputation as a source of such innovation for the automotive and transportation markets."

Frederick Cartwright, executive director of CU-ICAR

Sauras-Perez also sees the possibility of restaurants and shops offering digital coupons when drivers park close by.

The app could be used in a car, smart phone or global positioning system, Sauras-Perez said. He envisions launches in Los Angeles, New York and San Francisco. The business would be supported by a participation fee paid by on-street and parking garage companies, and shops and restaurants.

ParkinGain won in the contest's parking category, while Ready2Pick won the food category. Sauras-Perez and Gil said their applications could be ready for market in one to three years.

Frederick Cartwright, executive director of CU-ICAR, said industry and consumers are looking for "smarter mobility solutions."

"Projects such as these reinforce CU-ICAR's global reputation as a source of such innovation for the automotive and transportation markets," he said.

Gil said that Ready2Pick is envisioned as a way for drivers and passengers to use their time while idling in traffic.

It would suggest restaurants and stores close to users based on their preferences. Drivers could place an order with a voice- or touch-control, or a passenger could use a mobile device or in-car display, she said.

The application focuses on food and groceries because the drive-through infrastructure is already in place, but it could later be broadened to include any kind of service, Gil said.

Ready2Pick would also show estimated wait times at drive-throughs and routes to restaurants and stores. It would notify drivers about sales in the area, providing digital coupons that could be used immediately or later, Gil said.

Ads played on the radio would match driver preferences, she said. When drivers hear something they like, they would be able to click the dashboard to share on social media or a have a coupon downloaded to a phone, Gil said.

"From the moment a car is connected to the Internet, you are opening a new marketing channel for location-based services," she said. "This will help to broaden the reach of behavioral advertising. When you are connected to the Internet, you become more aware of your surroundings and can exchange information with it."

The main source of revenue would come from a transaction fee paid by companies that want to use Ready2Pick for advertising, Gil said.

The work Sauras-Perez and Gil are doing underscores the emphasis that they and others at CU-ICAR put on research that has clear practical value with high hopes of becoming products that drive the economy, while making lives better.

"You have to see the big picture," Sauras-Perez said. "Technology is awesome, but you have to have business models to make its development sustainable." ✻

Andrea Gil is the developer of Ready2Pick, a fast food app.

HEALTHIER LIVES HERE AND ABROAD

A student project targets Tanzania as students seek regulatory approval for new medical equipment that could help diabetic patients.

by Paul Alongi

Clemson University students have developed new medical equipment that could dramatically slash the cost of blood-sugar testing for diabetics and help prevent potentially fatal complications, especially in developing nations.

Tyler Ovington, Alex Devon and Kayla Gainey were on the team that won a Lemelson-MIT "Cure it!" prize in the undergraduate category for their GlucoSense project. The prize rewards students for working on technology-based inventions that can improve health care.

The work is part of the bioengineering department's broader effort to improve lives in Tanzania, where students and faculty are working to introduce several low-cost medical devices, including an infant warmer and grass-woven neck braces.

The latest inventions are test strips and a glucometer that are more affordable than commercial products and can be made from readily available parts. They work much the same as conventional test strips and glucometers. Diabetics put a drop of blood on a strip and then insert it in the glucometer to check whether their blood sugar is too high or low.

A key difference in the student-designed test strips is that they can be printed for about a penny each by rigging an inkjet printer to shoot enzymes instead of ink.

The potential cost-savings is huge. Commercially available test strips sell for about $1 each, and many diabetics need to use five or more a day. Students have also made a glucometer out of widely available parts that can be found in any U.S. electronics store or bought in bulk and shipped to remote parts of the world.

The work is part of the bioengineering department's broader effort to improve lives in Tanzania, where students and faculty are working to introduce several low-cost medical devices, including an infant warmer and grass-woven neck braces.

Clockwise from top: Professors John DesJardin and Delphine Dean work with students on low-cost medical test strips; onsite at a clinic in Tanzania; infant warming blankets save lives; rural Tanzania.

That's key because when medical equipment breaks in Tanzania, it can be tough for engineers to find replacement parts. Now that students have prototypes, they are working with regulators in the United States and Tanzania to get the necessary approvals for distribution. Human testing begins soon.

"What excites me most about this is it puts the technology in the hands of the people who are in need," said Ovington, who is from Greenville and graduated in May. "It empowers them to provide themselves with health care and make the standard of health care that we have in the U.S. more ubiquitous across the world to give all populations a fair chance at a life."

The GlucoSense team was mentored by professors Delphine Dean and John DesJardins and financially supported by Clemson's Creative Inquiry Program.

Dean, an associate professor of bioengineering, has been working in Tanzania since she took the lead on developing infant-warming blankets. She was among a group of faculty and students who met with Tanzanian President Jakaya Kikwete in the capital, Dar es Salaam, in January 2012.

Diabetes is a big problem for the East African nation, Dean said. And donations of commercially available test strips and glucometers haven't been much help.

"Some patients have to go without testing," she said.

Testing helps maintain blood sugar levels. When blood sugar is too high, diabetics need to take insulin. They need to eat when blood sugar is too low. Failing to maintain blood sugar levels can lead to complications, including kidney disease, high blood pressure, stroke, neuropathy, ketoacidosis and gastroparesis.

Gainey, a doctoral candidate from Sumter, said she learned about the work in Tanzania when she went to talk to Dean about graduate schools and internships about a year ago. As a Type 1 diabetic, Gainey had personal motivation to join the project. While she specializes in making the glucometer work electrically, she can also offer insight that non-diabetics can't.

"You know how the person is going to use it," she said. "It adds to things like how it opens and closes or the shape of the strip or the way you administer the blood drop."

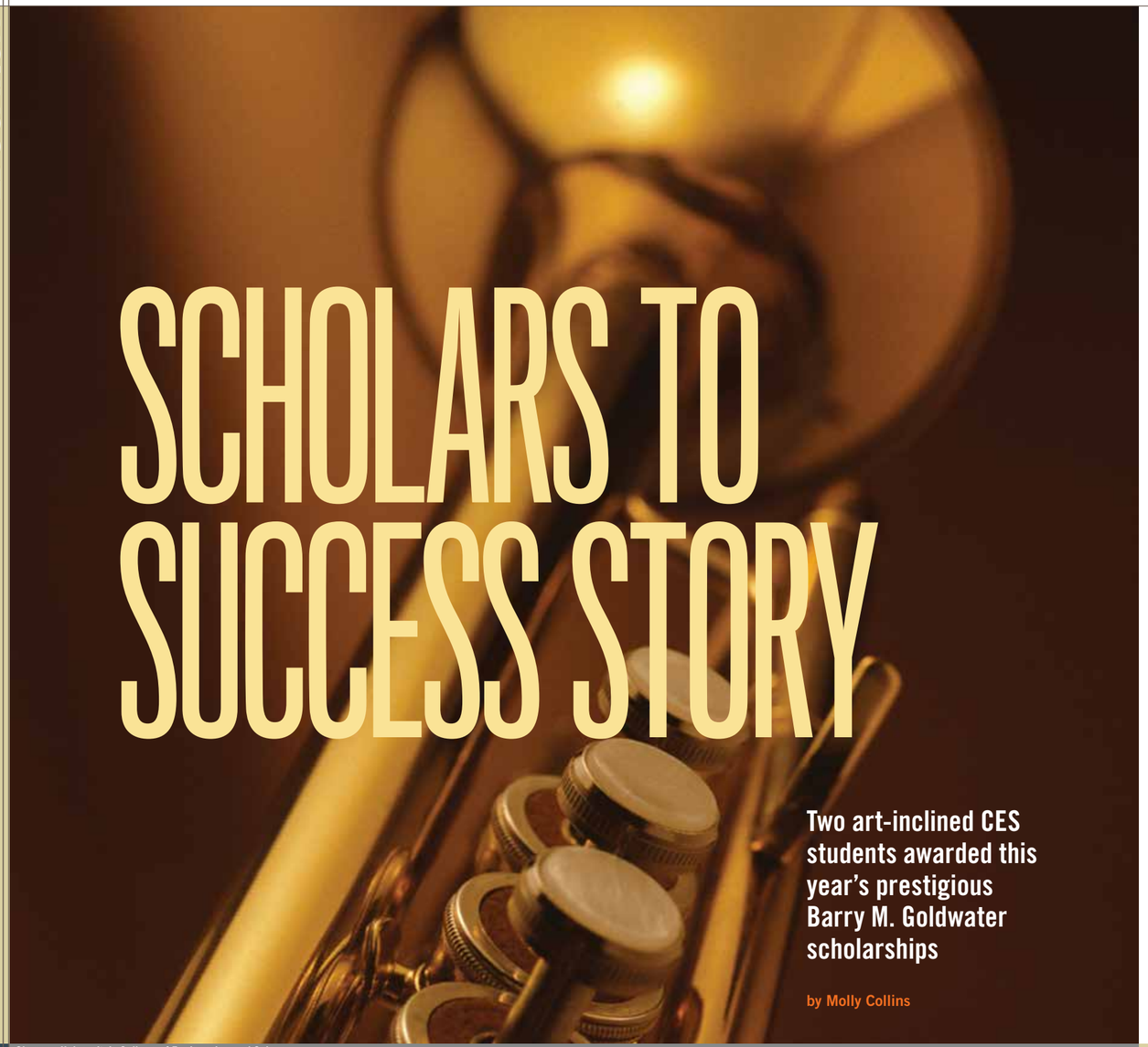
Dean said that at the outset, she hoped that the glucometer would be accurate enough to meet standards but didn't expect it to be as accurate as the meters currently on the market.

"It turns out our accuracy is quite good and is on par, if not better, than some of the meters on the market," she said.

Devon, who graduated in May and is from Greenville, said that he has been to Tanzania twice in the past six months and that what excites him most is the potential impact.

"I've done work on the infant warmer and just seeing the progression it has had and knowing the potential for this design is really incredible," he said. ✻

Healthier Lives: Tanzania



SCHOLARS TO SUCCESS STORY

Two art-inclined CES students awarded this year's prestigious Barry M. Goldwater scholarships

by Molly Collins

The Barry M. Goldwater Scholarship for Excellence in Science, Mathematics and Engineering recognizes the country's high demand for scientific advancement by awarding young scholars funding and investing in their promising futures.

The Goldwater Scholarship is a prestigious award of up to $7,500 annually to cover the tuition and expenses of college juniors and seniors who are pursuing careers in mathematics, science and engineering. These scholars often go on to pursue advanced degrees and become leading scientists, researchers and educators in their fields.

Established by Congress in 1986 to honor U.S. soldier and statesman Sen. Barry Goldwater, this federally funded scholarship and education program encourages excellence by awarding up to 300 scholarships per academic year to college sophomores and juniors nationwide.

For the 2014-15 school year, the foundation received 1,166 nominations and awarded 283 scholarships. In the past five years, Clemson has been home to 13 Goldwater Scholarships and four honorable mentions, and this year three Tigers received the award: Britany Avin, a junior genetics and biochemistry major, John Farmer, a junior physics major and Mary Katherine Showers, a junior bioengineering major. They have been credited with blazing trails with cutting-edge research — from combating neurodegenerative diseases to mapping the Milky Way to improving surgery outcomes by locating injuries through pressure sensors.

These accolades are exactly what young scientists are looking for during their collegiate experience. Meet the two Clemson University Goldwater Scholars from the College of Engineering and Science, whose unique and artistic talents drove their success as scholars and scientists.

In the past five years, Clemson has been home to 13 Goldwater Scholarships and four honorable mentions.

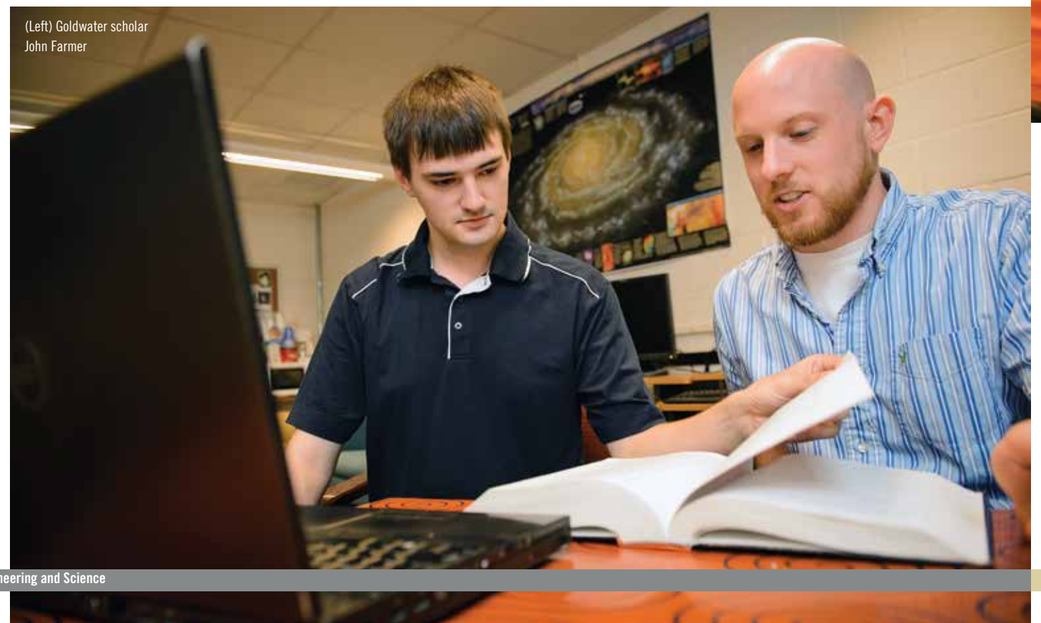
Pitch Perfect

When John Farmer isn't conducting groundbreaking research on particle physics, he's tuning his trumpet. A classically trained trumpeter, Farmer honed his musical chops with quintets and choirs at the South Carolina Governor's School for the Arts and Humanities. He balanced rigorous musical training with AP science courses, a task that would meld his talents in both fields into a cohesive ambition to excel as a physics major.

"Music and science complement each other in a number of ways, and I need to be doing both at the same time," Farmer says. When I'm doing research or coursework, I always need some sort of creative vent to work with, and the same is true when I'm working with music."

Farmer's Clemson professors have raved about his ability to use his love of music in the pursuit of an advanced scientific degree. They said the combination of skills is a marker of an innate intelligence that bears the hallmarks of a rising star in the physics field. He's garnered several University academic awards and was informed in May that he would be a 2014 Astronaut Scholar and the recipient of a $10,000 award from the Astronaut Scholarship Foundation, the largest monetary award given in the United States to science, technology, engineering and math undergraduate college students based solely on merit.

His research profile includes an internship at Fermilab, America's renowned particle physics and accelerator laboratory in Batavia, Illinois, and a three-month stint in La Serena, Chile, where he completed a NSF-RFU project on variable stars in the Milky Way at the Cerro-Tololo Inter-American Observatory — the same observatory that discovered the accelerating expansion of the universe. The Goldwater Scholarship will assist Farmer in his studies toward a Ph.D. in astrophysics, and it will support his desire to dedicate his talents to both teaching and research.



(Left) Goldwater scholar John Farmer

Goldwater Scholar Kate Showers, third from right

Bioengineering is a dance, and Kate Showers has the moves.

As a competitive Irish dancer, Showers saw that learning the steps to a routine was a gateway into the field of neuroscience.

"I was amazed at the mind's ability to process large amounts of information," Showers says. "I could watch a ten-second piece once or twice and dance it back perfectly. When movements would come to me in perfect rhythm without thought, I became interested in the mind's ability to coordinate movement, which led me to delve into research on neural stimulation."

Showers garnered several research opportunities through Clemson's bioengineering department, which have aided her in obtaining a series of top-notch internships. After participating in a Creative Inquiry project on ultrasound imaging for rotator cuff diagnosis with associate professor Delphine Dean and assistant professor David Kwartowitz, she gained acceptance into the Research Experience for Undergraduates program at the prestigious Center for Sensorimotor Neural Engineering at the University of Washington in Seattle. There, she studied sensors that notify a lower-limb amputee of an impending fall. This experience led to an internship with Cyberonics Inc. in Houston, where she spent this summer researching cutting-edge medical technology for improving patient care. ✻

News from Around the College

Naren Vyavahare (right)

Bioengineering center lands $11 million for tissue research

Clemson University has been awarded $11 million to expand a bioengineering center that helps mentor junior faculty members as they research how lab-grown tissue can treat some of the world's most debilitating diseases, ranging from heart disease to spinal cord injuries.

The money comes from a National Institutes of Health (NIH) program that supports the Centers of Biomedical Research Excellence (COBRE) nationwide. Clemson's center is the South Carolina Bioengineering Center of Regeneration and Formation of Tissues (SC BioCRAFT).

The $11 million will pay for maintaining and upgrading state-of-the-art facilities. It also will provide funds for five junior faculty to begin their research, said Naren Vyavahare, the SC BioCRAFT director and Hunter Endowed Chair of bioengineering. The grant is the largest from the NIH in the University's history and brings the total NIH funding for the center to $20.3 million.

U.S. commerce secretary touts education-industry partnership at CU-ICAR

The cutting-edge research and world-class education that are helping South Carolina play a leading role in the nation's manufacturing revival took center stage when U.S. Secretary of Commerce Penny Pritzker visited the Clemson University-International Center for Automotive Research (CU-ICAR).

Her visit included a private roundtable discussion about developing a qualified workforce and came as expanding automotive and tire companies heighten the state's importance in manufacturing.

"CU-ICAR is a tremendous example of an educational institution conducting the type of leading-edge research that will keep America competitive in the 21st century and also working directly with industry to train workers for in-demand, high-skilled jobs," said Pritzker.

"These industry-driven models are exactly what we need to replicate nationwide to promote economic growth. The Department of Commerce is committed to partnering with businesses and other federal agencies to help facilitate similar research and training programs around the country."

The visit was a chance to show Pritzker how Economic Development Administration (EDA) grants have supported CU-ICAR and the state's economy. The EDA, which is part of the Commerce Department, helped fund the Center for Emerging Technologies building.

U.S. Commerce Secretary Penny Pritzler visits CU-ICAR.

Left to right: Apparao Rao, John Ballato and Brian Powell, recognized by Governor Nikki Haley

Three professors win governor's awards for world-class research

Gov. Nikki Haley has recognized three College of Engineering and Science professors for the global impact of their research in optical materials science, nanoscale physics and environmental nuclear chemistry.

John Ballato and Apparao Rao each won the 2014 Governor's Award for Excellence in Scientific Research. Brian Powell won the 2014 Governor's Young Scientist Award for Excellence in Scientific Research.

Ballato is Clemson's vice president for economic development and a professor of materials science and engineering. Before being named to his current post, he was the director of the Center for Optical Materials Science and Engineering Technologies.

Rao is the R.A. Bowen Professor of Physics and the director of Clemson's Nanomaterials Research Laboratory.

Powell is an associate professor of environmental engineering and Earth sciences and oversees the environmental radiochemistry education and research program.

Valerie Pezzullo

Mechanical engineering graduate wins $100,000 for machine-tool application

A Clemson University graduate has won $100,000 for an application she developed to help monitor cutting conditions in machine tools.

Valerie Pezzullo, who completed her master's degree in mechanical engineering in May, won first prize in the MTConnect Challenge 2 for Machining Process Monitoring to Aid in Chatter Identification.

Her research adviser is Laine Mears, associate professor of automotive engineering. Pezzullo's research was done at CU-ICAR.

Pezzullo's application offers machining process monitoring, facilitates the communication of part-specific information, and includes customization and scalability for different manufacturing facilities and academic research institutions.

Clemson Vice President for Research R. Larry Dooley (right) and EPA Deputy Regional Administrator for the Southeast, A. Stanley Meiburg, inaugurate a new partnership.

Partnership opens door for Clemson University to do research with EPA

A new agreement that paves the way for Clemson University to do research with the U.S. Environmental Protection Agency could provide students with valuable real-world experience, while shedding new light on the climate and environment.

A memorandum of understanding calls for the University to support internships with the EPA and for Clemson faculty to design courses that fit with the agency's mission.

The EPA brings to the agreement data it has acquired through research and investigations, while Clemson specializes in developing new math and statistical models to answer scientific questions.

For students, the partnership could open the door to internships, workshops and research projects that help advance their careers. The memorandum seeks to enhance training of undergraduate and graduate students.

News from Around the College

Above: Disney FX artists honored recently by the Visual Effects Society include (from left to right), Dong Joo Byun, Eric W. Araujo, Tim Molinder and Clemson DPA alumnus, Marc Bryant.

Below: Jay Steele was credited in the animated movie "Frozen," which won an Academy Award.

Image Credit: Visual Effects Society, Rene Macura

Engineering and Science alumni ice awards for 'Frozen'

Two Clemson University alumni have been honored for their work on the Disney hit film "Frozen." The motion picture won best animated feature film at the 2014 Academy Awards last spring.

Marc Bryant is a graduate of the digital arts program, and Jay Steele received his Ph.D. in computer science.

Bryant was part of an animation team that recently received a Visual Effects Society (VES) award for its work on the movie. VES awards recognize the most outstanding visual effects work of the year and honor the artists who created them.

Steele was credited in the movie in the area of animation technology. He is currently a senior software engineer at Walt Disney Animation Studios in Los Angeles.

Clemson University strengthens ties with BMW

A team of faculty and students recently went to BMW Research and Development and Engineering Center (FIZ) in Munich as part of an effort to expand the University's partnership with the German automaker.

The trip came just days after BMW announced that it planned to invest $1 billion in its Greer plant and hire another 800 workers to build its new X7 model.

Members of the Clemson team presented their work in a variety of areas. There was also an exhibit showcasing the Deep Orange 4 concept car, which was sponsored by BMW and included contributions from a number of BMW suppliers.

Manfred Erlacher, president of BMW Manufacturing Company

Paul Venhovens, the BMW Endowed Chair in Automotive Systems Integration, presented an invited lecture as part of the BMW Forschung's Colloquium on the Deep Orange concept vehicle program, highlighting its unique educational experience as a tool for workforce development.

The team's goal was to show the University's capabilities to the BMW network in manufacturing research, business, IT and energy management, said Imtiaz Haque, executive director of the Carroll A. Campbell Graduate Engineering Center and Founding Chair of the Department of Automotive Engineering.

Automotive engineering professor wins Ralph R. Teetor Educational Award

A Clemson University associate professor of automotive engineering has won the Society of Automotive Engineers' (SAE) Ralph R. Teetor Educational Award.

Beshah Ayalew won in the ground vehicle category in recognition of significant contributions to teaching, curriculum development and research, including grants, independent research and professional development.

Established in 1963, the award is administered by the Teetor Educational Award Committee of the Society of Automotive Engineers. The SAE Teetor Program stimulates contacts between younger engineering educators and practicing engineers in industry and government. It is open to young engineering educators with more than three, but less than ten years of full-time faculty experience.

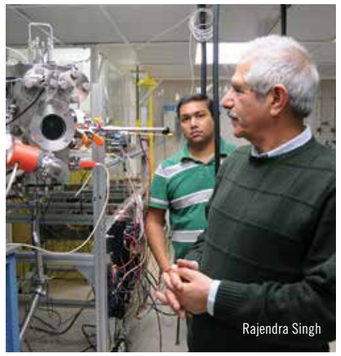
U.S. Department of Commerce invests $2 million in CU-ICAR incubator

U.S. Secretary of Commerce Penny Pritzker recently announced that the Department's Economic Development Administration (EDA) is awarding a $2 million grant to build the Research One building at the Clemson University International Center for Automotive Research (CU-ICAR).

The Research One building will provide space for private-public partnerships focused on developing new technologies in the automotive, mobility and IT fields, supporting the intersection of productivity, innovation and entrepreneurship.

The new building will sit adjacent to the CU-ICAR Center for Emerging Technologies, which EDA supported through a $3 million investment in 2009. The facility helps complete the technology chain from laboratory to the consumer end-user by providing the office and lab space that companies need to develop new technologies in the automotive, mobility and energy fields.

The Research One building will create 220 jobs and generate $2.6 million in private investment at the outset.


Rajendra Singh

White House honors professor as 'Champion of Change' for solar deployment

The White House honored Clemson professor Rajendra Singh as a "Champion of Change" for his efforts to promote and expand solar deployment in the residential, commercial and industrial sectors.

Singh, the D. Houser Banks Professor of Electrical and Computer Engineering and director of Clemson's Center of Silicon Nanoelectronics, led the charge across the country to create jobs and economic opportunity in solar power and in driving policy changes at the local level to further advance solar deployment.

Singh devoted his doctoral thesis research to solar cells in 1973 during the Arab oil embargo, and in the last 40 years he has served as a visionary leader to advance the technology of photovoltaic module manufacturing.

WISE honored for girls' engineering program

Clemson University's Women in Science and Engineering Program (WISE) received the 2013 Introduce a Girl to Engineering Award from the National Engineers Week Foundation and Women in Engineering Programs and Advocate Networks (WEPAN). The award honors organizations for outstanding outreach efforts as a part of National Engineers Week and Introduce a Girl to Engineering Day.

WISE encourages females in engineering and science majors to prepare for, obtain and succeed in their careers by offering mentoring, advising and networking opportunities.

"The award is a national seal of approval," said Serita Acker (top, center), director of the WISE program. "With Clemson being the top engineering school in South Carolina, it shows that we have a strong desire for diversity and want to expose everyone to the opportunities in engineering, science and math."

News from Around the College

Celebrating the Big 5-0!

A Clemson University department that helped pioneer the use of engineering principles to understand and treat disease is celebrating 50 years of awarding graduate degrees.

The University's bioengineering department now has more than 450 students and a presence in Greenville and Charleston. The department, originally called interdisciplinary studies, granted its first Ph.D. in 1963.

The department is home to the Clemson University Biomedical Engineering Innovation Campus (CUBEInC), a 30,000-square-foot economic engine that opened two years ago at Greenville Health System's Patewood Medical Campus.

Clemson's bioengineering department remains headquartered at Rhodes Engineering Research Center on Clemson's main campus. The department added a master of science program in 1966 and a bachelor of science in 2006.

"For 50 years, our graduates have led biomedical research and technological enterprise," said bioengineering chairwoman Martine LaBerge. "Our platform for educating these leaders has been a culture focused on discovery and innovation."

The bioengineering department now has 24 primary faculty members who are tenured or on track for tenure; 12 joint and research faculty members; and 12 technical and administrative staff members.

Emagine! encourages S.C. students to consider engineering

A Clemson University team traveled across South Carolina to urge middle and high school students to consider careers in engineering.

Professors, students and staff took their Emagine! tour to four cities across the Palmetto State, including Spartanburg, North Charleston, Florence and Greenville. Promoting engineering and science comes at a time when the state's economic future is becoming increasingly linked to whether it can educate enough engineers.

Employees with technical skills are critical to filling the needs of some of the state's largest employers, such as Boeing, BMW, Duke Energy, Fluor, GE and Milliken. They also will help recruit new businesses that provide even more jobs.

Professors led students through a series of challenges aimed at showing how engineering and science apply to the real world. The middle and high school students also learned about internships, study-abroad options and campus life.

Emagine! is part of a broader outreach by Clemson to draw more students into STEM disciplines — science, technology, engineering and math.

Eileen T. Kraemer

Cole Smith

Joe Watkins

Leadership Changes

Eileen T. Kraemer, Ph.D., is the new C. Tycho Howle Director of the School of Computing. Kraemer comes to Clemson from the University of Georgia, where she was associate dean of the Franklin College of Arts and Sciences.

In her new job, Kraemer oversees a school whose enrollment has grown nearly 84 percent, from 387 in 2007 to 712 in 2013. The school has 31 faculty who are tenured or on track to be tenured and six lecturers.

Her research has combined psychology and computer science to find new ways of helping students achieve more in computer science.

The School of Computing includes three divisions: computer science, visual computing and human-centered computing. The school offers seven undergraduate and graduate degree programs.

Kraemer received a Ph.D. in computer science from the Georgia Institute of Technology in 1995. She was assistant professor of computer science at Washington University in St. Louis from 1995 to 1998.

The C. Tycho Howle Directorship in the school of computing was made possible by an endowment created by the family of C. Tycho Howle, a longtime supporter of Clemson. The endowment provides support for the director's salary and various activities, such as research.

A Clemson University graduate is returning to his alma mater to lead the industrial engineering department in the midst of an enrollment boom and a $10 million expansion of its home building.

Cole Smith, Ph.D., graduated from Clemson in 1996 with a bachelor of science in mathematical sciences with an emphasis on computer science. He most recently was professor and interim chair of the industrial and systems engineering department at the University of Florida.

His appointment is the latest move in a career that has included research in a wide range of complex systems, including flight plans and bracket assignments for the NCAA men's basketball tournament.

Scott Mason has been serving as the department's interim chair since Anand Gramopadhye vacated the position in July 2013 to become dean of the College of Engineering and Science.

Smith takes over the department as global demand for industrial engineers grows.

The number of undergraduate, masters and doctoral students enrolled in industrial engineering at Clemson has grown more than 50 percent in five years.

Construction on Freeman Hall, the department's home, is now underway. A three-story addition will include new offices, conference rooms and a 108-seat auditorium.

Smith received his Ph.D. in industrial systems and engineering from Virginia Polytechnic Institute and State University in 2000.

The new director of Clemson University's general engineering department is a career naval officer who has served aboard three nuclear submarines and has done research on how lasers can be used as weapons.

Joe Watkins, Ph.D., who will retire as a captain after 31 years in the Navy, comes to Clemson from the U.S. Naval Academy. He was most recently associate professor and general engineering program director in the academy's mechanical engineering department.

All students who want to major in engineering at Clemson are admitted to the general engineering program before picking a specific field. Students take courses that prepare them for the work they will face in upper-level classes and their careers. They are also offered academic advising and career counseling.

Watkins is a veteran of the Navy's submarine force, serving in three nuclear submarines from 1983 to 2001. His last afloat tour was as executive officer of USS Louisville, SSN 724.

He was awarded a Ph.D. in mechanical engineering in 2004. He also holds a master of science in astronautical engineering, a bachelor of science equivalency in electrical engineering and a bachelor of science in chemical engineering from Auburn University.

Spiro Institute recognizes CES alumnus

Clemson University's Spiro Institute for Entrepreneurial Leadership recognized CES alumni Greg Smith with an Innovative Spirit Award.

Smith earned his Bachelor of Science in mechanical engineering from Clemson in 1984 and also holds a master's degree in international business from the University of South Carolina.

In 2000, Smith co-founded and was CEO and chairman of Advectis Inc., the exclusive provider of BlitzDocs, which is the most widely used solution for electronic document collaboration in the mortgage industry.

Xerox acquired Advectis in 2007, with Smith staying on for four years to serve as vice president and general manager of Xerox Mortgage Services.

In 2011, Smith formed Blue Vista Ventures LLC, where he is president. Blue Vista advises and invests in early-stage technology companies.

Smith is a member of numerous professional and advisory boards. He and his wife, Carol, whom he met at Clemson, are actively involved in philanthropic efforts supporting several ministries domestically and around the world.

Alumni and department chair honored at college banquet

Five Clemson University alumni and a current department chair were honored at the 19th annual College of Engineering and Science banquet.

Three of the honorees were inducted into the Thomas Green Clemson Academy of Engineering and Science, the college's highest honor. Three others were recognized as Outstanding Young Alumni.

Honorees were selected by a review committee made up of college dean Anand Gramopadhye, two senior faculty members from the college, two of the college's alumni and two college advisory board members.

Academy inductees

James Albritton graduated from Clemson's engineering mechanics department with a master of science degree in 1988. His professional career began at the Fort Worth Division of General Dynamics where he was involved with materials research and development.

Albritton nurtured a keen interest in highway safety product design and in 1991 won a Small Business Innovation Research (SBIR) grant from the U.S. Department of Transportation.

With the SBIR award, Albritton founded Exodyne Technologies, and won a $300,000 SBIR phase II award for full-scale development. He began working with Trinity Industries to improve the design of guardrails.

Over the past 14 years, Albritton has been awarded 16 U.S. patents and more than 50 foreign patents related to optimized design of highway guard rails, crash cushions and end terminals. His application of the engineering principles he learned at Clemson has resulted in products that save lives every day.

He and his wife, Jill, a 1988 Clemson biological sciences graduate, have two children, Sara and Aaron, who are currently students in the College of Engineering and Science.

Mark Leising is the current chair of Clemson's physics and astronomy department. A highlight of his career was the discovery of gamma-ray line emission from radioactive cobalt-56 and cobalt-57 nuclei in supernova 1987A. This event provided the first explicit proof of explosively produced radioactive nuclei in supernova explosions.

In February 1987, when supernova 1987A exploded in the Large Magellanic Cloud, Leising was already at work at the U.S. Naval Research Laboratory converting the sun-viewing gamma-ray spectrometer on Solar Maximum Mission to function as the detector of 56Co gamma rays from astronomical objects. Leising's name will live in history as a member of that discovery team and of the Compton Gamma Ray Observatory discovery team that found the evidence for a second radioactive isotope, 57Co.

He remained a part of the Compton team even after accepting an assistant professorship at Clemson. He and his students have published some 60 papers using CGRO data.

As Clemson professor, Leising has advised eight Ph.D. students, supervised eight masters theses and was research adviser for 20 undergraduate students. He directed the recent renovation of the Clemson University Planetarium.

Robert Skelton is professor emeritus of mechanical and aerospace engineering at the University of California, San Diego. At UCSD he was the inaugural Daniel L. Alspach Professor of Dynamic Systems and Controls.

Skelton earned his bachelor degree in electrical engineering in 1963 from Clemson, where he won the Walter Merritt Riggs Award as the most outstanding senior in electrical engineering. He went on to earn a master of science from the University of Alabama-Huntsville and a Ph.D. in mechanics and structures from University of California, Los Angeles in 1976.

Skelton began his career in industry, where his work in systems control contributed both to the success of SKYLAB and later, the Hubble Space Telescope. He joined the faculty of Purdue University and enjoyed a two-decade career before moving to the University of California, San Diego. Skelton's research focused on the design of dynamic feedback control systems for a variety of applications.

Skelton has published more than 140 journal papers and has authored three books. In 2012, he was inducted into the National Academy of Engineering. Skelton is the only known Clemson graduate to ever attain this high honor.

Outstanding Young Alumni honorees are (left to right): Mathew Kuttolamadom, Jeffrey Plumblee and Keisha Walters with CES dean Anand Gramopadhye. Thomas Green Clemson Academy inductees include: James Albritton, Mark Leising and Robert Skelton.

Outstanding Young Alumni awards

Mathew Kuttolamadom was the first interdepartmental Ph.D. student in materials science and automotive engineering. While at Clemson, Kuttolamadom completed two comprehensive U.S. Department of Energy projects on lightweighting components for automotive design.

Texas A&M later invited him to become a new faculty member for the Department of Engineering Technology and Industrial Distribution. Two of his publications are among the Top 10 Most Downloaded Articles in the ASME *Journal of Manufacturing Science Engineering*.

Jeffrey Plumblee was a founding member of Clemson Engineers for Developing Countries.

CEDC began in 2009 when Plumblee and six other civil engineering students began working with the Episcopal Diocese of Upper South Carolina, which had a mission to upgrade the 30-year-old water system in Cange, Haiti. Five years and some $1.5 million dollars later, the project is providing clean water to 10,000 residents of Haiti's Central Plateau.

In January, the Institute of International Education recognized the CEDC with a 2014 Andrew Heiskell Award — one of the top awards in the world of international education.

Keisha Walters is an associate professor at Mississippi State University, where her research in nanoparticles and stimuli-responsive materials has led to more than 120 presentations at major national and international conferences, companies, national labs and academic institutions. She has authored or co-authored 23 publications and book chapters, and she has generated more $1.7 million in research support.

Walters has won numerous teaching and research awards. They include the National Academy of Engineering and the 2012 Raymond W. Fahien Award from ASEE, a national award that recognizes the outstanding chemical engineering educator under 40 years old.

Departments

Automotive Engineering

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Fast Facts

Tenured/tenure-track faculty: 13

Enrollment: (Spring 2014)

Undergraduate	0
Master's	147
Doctoral	57

Degrees awarded: (12/13; 5/14)

Undergraduate	0
Master's	20
Doctoral	4

Research expenditures: $2,232,579 (FY13)

Research thrusts: systems integration, vehicle manufacturing, vehicle design and development, vehicular electronics

Bioengineering

Martine LaBerge, Ph.D.
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Fast Facts

Tenured/tenure-track faculty: 24

Enrollment: (Spring 2014)

Undergraduate	313
Master's	37
Doctoral	76

Degrees awarded: (12/13; 5/14)

Undergraduate	96
Master's	13
Doctoral	9

Research expenditures: $5,444,984 (FY13)

Research thrusts: biomaterials engineering, bioelectrical engineering

Chemical and Biomolecular Engineering

Douglas Hirt, Ph.D.
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Fast Facts

Tenured/tenure-track faculty: 12

Enrollment: (Spring 2014)

Undergraduate	202
Master's	1
Doctoral	31

Degrees awarded: (12/13; 5/14)

Undergraduate	43
Master's	1
Doctoral	4

Research expenditures: $1,661,464 (FY 13)

Research thrusts: advanced materials, kinetics and catalysis, energy, chemical and biochemical separations, molecular modeling and simulation, biosensors and biochips

Chemistry

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Fast Facts

Tenured/tenure-track faculty: 22

Enrollment: (Spring 2014)

Undergraduate	140
Master's	3
Doctoral	91

Degrees awarded: (12/13; 5/14)

Undergraduate	26
Master's	2
Doctoral	11

Research expenditures: $3,012,293 (FY 13)

Research thrusts: analytical, inorganic, organic physical chemistry, chemical education, interdisciplinary and nontraditional areas: polymer and materials chemistry, solid-state chemistry, bioanalytical chemistry, bioorganic and medicinal chemistry, computational chemistry, chemical physics

Glenn Department of Civil Engineering

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Fast Facts

Tenured/tenure-track faculty: 23

Enrollment: (Spring 2014)

Undergraduate	400
Master's	52
Doctoral	68

Degrees awarded: (12/13; 5/14)

Undergraduate	139
Master's	30
Doctoral	8

Research expenditures: $3,284,580 (FY13)

Research thrusts: sustainable and resilient infrastructure

School of Computing

Eileen Kraemer, Ph.D.
C. Tycho Howle Director of the School of Computing

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Fast Facts

Tenured/tenure-track faculty: 29

Enrollment: (Spring 2014)

Undergraduate	482
Master's	135
Doctoral	83

Degrees awarded: (12/13; 5/14)

Undergraduate	58
Master's	59
Doctoral	1

Research expenditures: $5,040,766 (FY13)

Research thrusts: computing foundations, data analytics, software engineering, cyberinfrastructure, networking, bioinformatics, computer graphics and animation, eye tracking, visualization, digital arts, intelligent and interactive systems, identity science and affective computing, virtual environments, human/computer interaction, pedagogical tools using tablet PCs and handheld devices

Holcombe Department of Electrical and Computer Engineering

Daniel Noneakar, Ph.D.
Interim Department Chair

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Fast Facts

Tenured/tenure-track faculty: 30

Enrollment: (Spring 2014)

Undergraduate	492
Master's	70
Doctoral	89

Degrees awarded: (12/13; 5/14)

Undergraduate	107
Master's	25
Doctoral	9

Research expenditures: $5,092,256 (FY13)

Research thrusts: optoelectronics, cyberinfrastructure, wireless communications, computer networks, nanoelectronic materials processing, biochips, semiconductor lasers, optical systems, integrated circuit design, high-performance computing, computer security, robotics, image processing, biological modeling, situation and threat assessment, power systems

Environmental Engineering and Earth Sciences

David Freedman, Ph.D.
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Fast Facts

Tenured/tenure-track faculty: 22

Enrollment: (Spring 2014)

Undergraduate	194
Master's	66
Doctoral	41

Degrees awarded: (12/13; 5/14)

Undergraduate	53
Master's	18
Doctoral	4

Research expenditures: $3,160,999 (FY13)

Research thrusts: environmental chemistry, environmental fate and transport, hydrogeology, nuclear environmental engineering and science, biosystems engineering, process engineering, sustainable systems

Industrial Engineering

Cole Smith, Ph.D.
Department Chair

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Fast Facts

Tenured/tenure-track faculty: 14

Enrollment: (Spring 2014)

Undergraduate	308
Master's	163
Doctoral	33

Degrees awarded: (12/13; 5/14)

Undergraduate	63
Master's	34
Doctoral	5

Research expenditures: $1,699,845 (FY13)

Research thrusts: supply chain optimization and logistics, human factors and safety in health care and in technologically complex environments, education and learning systems

Materials Science and Engineering

Raj Bordia, Ph.D.
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Fast Facts

Tenured/tenure-track faculty: 15

Enrollment: (Spring 2014)

Undergraduate	127
Master's	12
Doctoral	40

Degrees awarded:(12/13; 5/14)

Undergraduate	27
Master's	0
Doctoral	4

Research expenditures: $3,458,405 (FY13)

Research thrusts: manufacturing, characterization and structure/property/performance relationships of ceramics, glasses, polymers, photonics/optics, fiber-based materials, thin films, metals

Departments

Mathematical Sciences

Jim Coykendall, Ph.D.
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Fast Facts

Tenured/tenure-track faculty: 48

Enrollment: (Fall 2014)

Undergraduate	157
Master's	24
Doctoral	105

Degrees awarded: (12/13; 5/14)

Undergraduate	36
Master's	21
Doctoral	8

Research expenditures: $1,393,682 (FY13)

Research thrusts: algebra and discrete mathematics, applied analysis, biomathematics, computational mathematics, experimental statistics, operations research, probability and statistics

Mechanical Engineering

M.K. "Ram" Ramasubramanian, Ph.D.
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Fast Facts

Tenured/tenure-track faculty: 28

Enrollment: (Spring 2014)

Undergraduate	684
Master's	115
Doctoral	64

Degrees awarded: (12/13; 5/14)

Undergraduate	154
Master's	33
Doctoral	5

Research expenditures: $2,725,903 (FY13)

Research thrusts: transportation, energy, design, materials, manufacturing, fluids, complexity, multi-scale modeling

Physics and Astronomy

Mark Leising, Ph.D.
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Fast Facts

Tenured/tenure-track faculty: 25

Enrollment: (Spring 2014)

Undergraduate	73
Master's	3
Doctoral	58

Degrees awarded: (12/13; 5/14)

Undergraduate	26
Master's	1
Doctoral	1

Research expenditures: $3,869,049 (FY13)

Research thrusts: astronomy and astrophysics, atmospheric and space physics, materials physics, surface physics, theoretical quantum physics

The BMW Information Technology Research Center sits beside the Campbell Graduate Engineering Center, which is part of Clemson University's International Center for Automotive Research. The ITRC is an integral part of BMW's research and development network.

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Clemson College of Engineering and Science students traveled to Cange, Haiti, last year, where they installed a student-designed, student-built and donor-funded water filtration system. The project marks the first chlorinated water system in Haiti's Central Plateau. It is just one example of a sustainable solution initiated by an interdisciplinary team of students, aimed at improving quality of life worldwide.