NC STATE UNIVERSITY

Electrical & Computer Engineering

SPOTLIGHT

IN THIS ISSUE

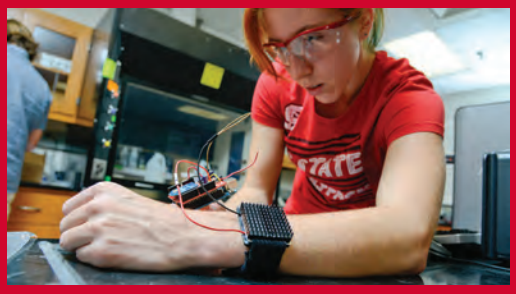
New Devices, Wearable System Aim to Predict, Prevent Asthma Attacks

New Tech Uses Hardware, Software to Train Dogs More Efficiently

ECE Team Wins Spectrum-Sharing Radio Contest

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING | COLLEGE OF ENGINEERING NORTH CAROLINA STATE UNIVERSITY 2016

ON THE COVER



New Devices to Predict, Prevent Asthma Attacks PAGE 04

CONTENTS

Message from the Department Head
PAGE 03

New Devices, Wearable System Aim to Predict, Prevent Asthma Attacks
PAGE 04

New Tech Uses Hardware, Software to Train Dogs More Efficiently
PAGE 06

ECE Team Wins Spectrum-Sharing Radio Contest
PAGE 08

Three Park Scholars for the Class of 2020 select ECE
PAGE 09

Garcia one of 31 NC State students to score NSF Fellowships
PAGE 10

ECE Student one of 5 NC State Fulbright Scholars
PAGE 10

Lobaton and Bozkurt receive NSF CAREER Awards
PAGE 11

Baliga's Book Wins 2016 PROSE Award
PAGE 12

Rotenberg Receives the 2015 Micro Test-of-Time Award
PAGE 13

Nagle and Misra named Distinguised Professors
PAGE 14

Floyd receives 2016 Outstanding Teacher Award
PAGE 14

Cirrus Logic Continues to Invest In the College and in Electrical Engineering
PAGE 15

Sensus Reach Scholarship Established for NC State University's College of Engineering
PAGE 15

Alumnus Endows Scholarship for Veterans
PAGE 16

Veliadis Named PowerAmerica CTO
PAGE 17

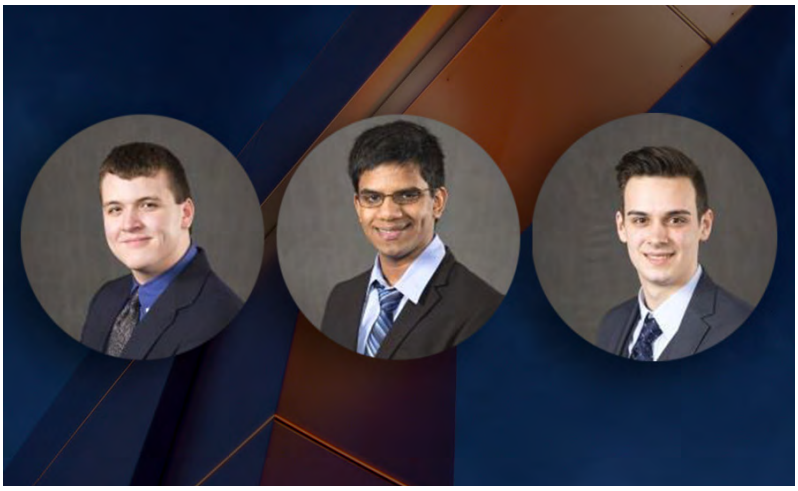
Franzon new ECE Director of Graduate Programs
PAGE 17

ECE Alumni Spotlight
PAGE 18

ISSUE FOCUS

New Tech Uses Hardware, Software to Train Dogs More Efficiently PAGE 06

ECE Team Wins Spectrum-Sharing Radio Contest PAGE 08



Three Park Scholars for the Class of 2020 select ECE PAGE 09

MESSAGE FROM THE DEPARTMENT HEAD

Success comes in many forms for electrical and computer engineers and the departments where they get their start.

Sometimes, it's winning awards like the PROSE Award won by Dr. Jay Baliga's book, "The IGBT Device: Physics, Design and Applications of the Insulated Gate Bipolar Transistor." Other times, it's gaining recognition like our student who was named a winner of the prestigious Fulbright grant. It can also manifest as new devices that improve health like the wearable system that aims to predict asthma attacks developed by NC State researchers.

You'll find more examples of success in the pages that follow so rather than repeat what you'll soon be reading, I want to spotlight a far-reaching form of it: cross-industry collaboration that epitomizes what's needed to drive change. Collaboration like the work that's happening here on the Centennial Campus in the PowerAmerica Institute.

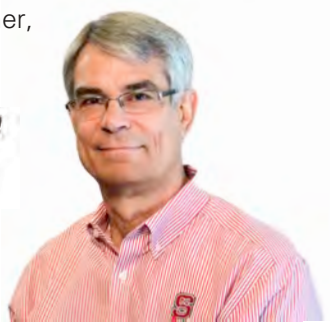
PowerAmerica brings the wide bandgap industry together to facilitate technology roadmapping and member networking. Through it, researchers promote the benefits of wide bandgap technology to members' supply chains and customer communities to help create demand for members' products. Yes, making wide bandgap semiconductor technologies cost competitive with silicon-based power electronics and improving their performance is exciting news in and of itself, but what's also thrilling about PowerAmerica is the multifaceted collaboration that it facilitates.

Through PowerAmerica, our researchers collaborate with The Florida State University, UC Davis, Virginia Tech and more—the same cross-institutional collaboration that we've been celebrating on Charge all year. There's more, though. Along with strengthening educational capabilities in academia, it also facilitates closer ties between the U.S. Department of Energy, industry and researchers, promoting workforce development needed for industries to thrive.

We're excited to lead this institute that will catalyze growth in the power electronics industry. Read on for more news about PowerAmerica and all of the other innovations and collaborations that have helped us confidently claim 2016 as a very good year.

To another year of working together,

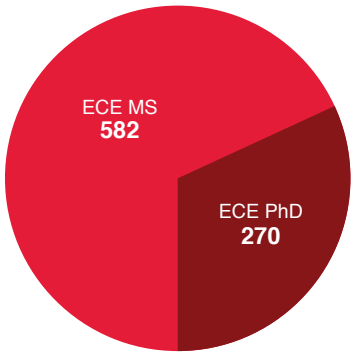
Daniel D. Stancil
ECE Department Head



Total Research Expenditures

NC State ECE Rank by Total Research Expenditures for 2015

Total ECE Graduate Enrollment by Degree for Fall 2016



New Devices, Wearable System Aim to Predict, Prevent Asthma Attacks

Researchers at NC State have developed an integrated, wearable system that monitors a user's environment, heartrate and other physical attributes with the goal of predicting and preventing asthma attacks with testing to begin on alarger subject population this summer.

The system, called the Health and Environmental Tracker (HET), is composed of a suite of new sensor devices and was developed by researchers from the National Science Foundation's Nanosystems Engineering Research Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST) at North Carolina State University.

> **"Preventing an attack could be as simple as going indoors or taking a break from an exercise routine"**

"Our goal was to design a wearable system that could track the wellness of the subjects and in particular provide the infrastructure to predict asthma attacks, so that the users could take steps to prevent them by changing their activities or environment," says Alper Bozkurt, the principal investigator of a paper describing the work and an associate professor of electrical and computer engineering at NC State.

"Preventing an attack could be as simple as going indoors or taking a break from an exercise routine," says James Dieffenderfer, lead author of the paper and a Ph.D. student in the joint biomedical engineering program at NC State and the University of North Carolina at Chapel Hill.

The HET system incorporates a host of novel sensing devices, which are incorporated into a wristband and a patch that adheres to the chest. The patch includes sensors that track a patient's movement, heart rate, respiratory rate, the amount of oxygen in the blood, skin impedance and wheezing in the lungs.

The wristband focuses largely on environmental factors, monitoring volatile organic compounds and ozone in the air, as well as ambient humidity and temperature. The wristband also includes additional sensors to monitor motion, heart rate and the amount of oxygen in the blood.

The system also has one nonwearable component: a spirometer, which patients breathe into several times a day to measure lung function.

"The uniqueness of this work is not simply the integration of various sensors in wearable form factors," says Veena Misra, co-author of the paper and a professor of electrical and computer engineering at NC State. "The impact here is that we have been able to demonstrate power consumption levels that are in the sub-milliwatt levels by using nano-enabled novel sensor technologies. Comparable, existing devices have power consumption levels in the hundreds of milliwatts."

"This ultra-low power consumption is important because it gives the devices a long battery life, and will make them compatible with the power generated by the body - which is not a lot," says Misra, who is also the director of the ASSIST Center. "It enables a pathway to realize the ASSIST Center's vision of wearable sensors powered by energy from the body in the near future."

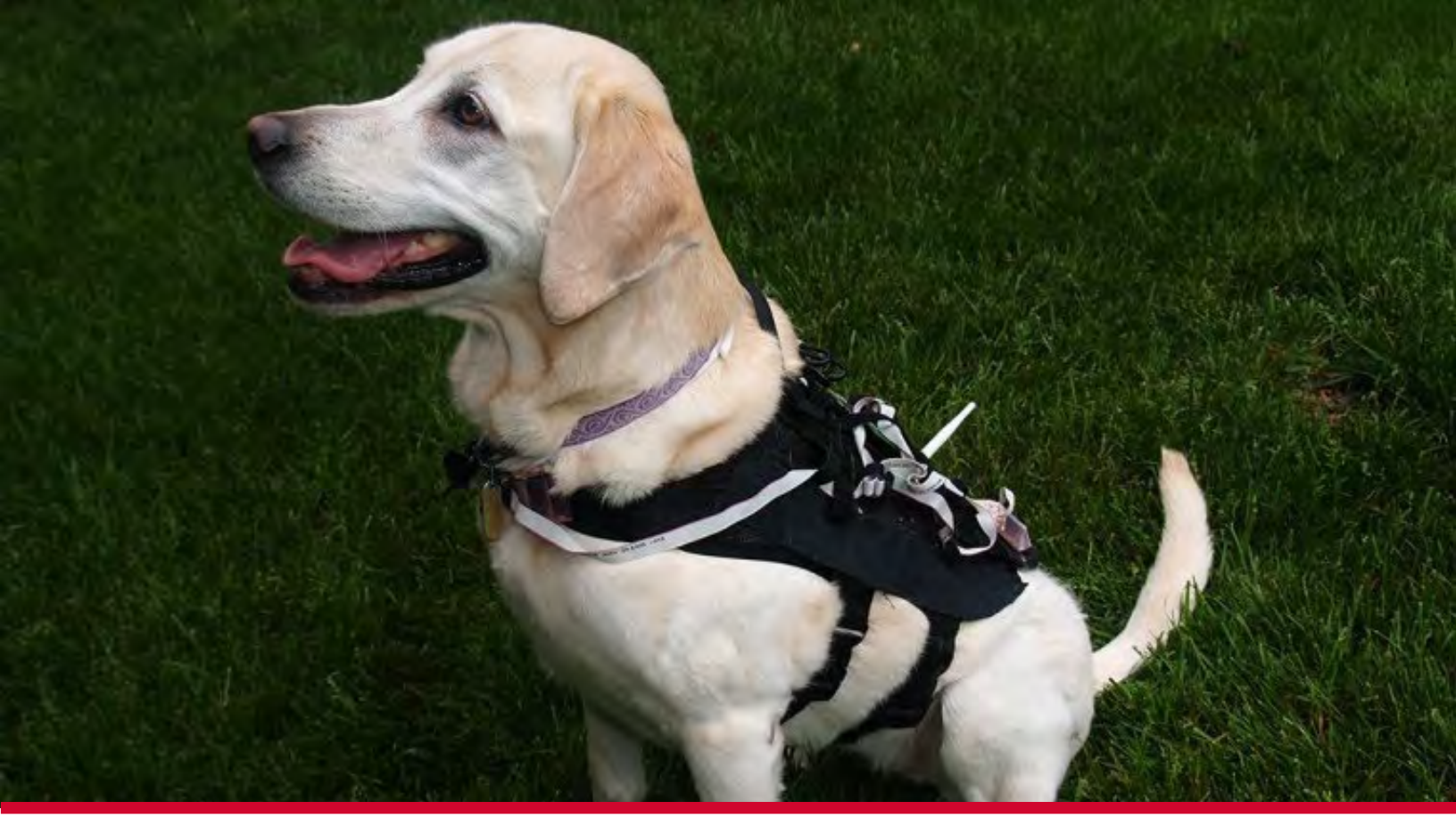
"Once we have the data, the center can begin developing software that will track user data automatically and give users advance warning of asthma attacks"

"Once we have data, the center can begin developing software that will track user data automatically and give users advance warning of asthma attacks," says Bozkurt, who as testbed leader of the ASSIST Center is overseeing HET system integration. "And that software will allow users to synch the HET to their smartphones so that they can monitor their health on the go. After these tests are completed, and the prediction software created, we are hoping that a fully functional HET system will be available."

The paper, "Low Power Wearable Systems for Continuous Monitoring of Environment and Health for Chronic Respiratory Disease," is published in the IEEE Journal of Biomedical and Health Informatics.

The paper was co-authored by Henry Goodell and Brinnae Bent of the joint biomedical engineering program; Steven Mills, Michael McKnight, Shanshan Yao, Feiyan Lin, Eric Beppler, Bongmook Lee, Veena Misra, Omer Oralkan, Jason Strohmaier, John Muth, and Alper Bozkurt of NC State; and Dr. David Peden of UNC-CH.

Story by Matt Shipman



New Tech Uses Hardware, Software to Train Dogs More Efficiently

North Carolina State University researchers in ECE and Computer Science have developed and used a customized suite of technologies that allows a computer to train a dog autonomously, with the computer effectively responding to the dog based on the dog's body language.

"Because the technology integrates fundamental principles of animal learning into a computational system, we are confident it can be applied to a wide range of canine behaviors," says Alper Bozkurt, an assistant professor of electrical and computer engineering and co-author of the paper. "For example, it could be used to more quickly train service dogs. Ultimately, we think the technology will be used in conjunction with human-directed training."

> **"...the technology integrates fundamental principles of animal learning into a computational system..."**

The dog harness fits comfortably onto the dog and is equipped with a variety of technologies that can monitor the dog's posture and body language. Each harness also incorporates a computer the size of a deck of cards that transmits the sensor data wirelessly. The researchers published a paper about the harness's potential applications in late 2014.

For the current study, the researchers wrote an algorithm that triggered a beeping sound and the release of dog treats from a nearby dispenser whenever the dog's harness sensors detected that the dog went from standing to sitting.

The researchers had to ensure that the reinforcement was given shortly after the desired posture was exhibited, and also ensure that rewards were only given for the correct posture. This required a trade-off. If the algorithm ran long enough to ensure the correct posture with 100 percent certainty, the reinforcement was given too late to be effective for training purposes. But if the reinforcement was given immediately, there was a high rate of rewarding the wrong posture.

To address this, the researchers worked with 16 volunteers and their dogs to optimize the algorithm, finding the best possible combination of speed and accuracy. The researchers then compared the algorithm's timing and accuracy to that of an expert human trainer.

The algorithm was highly accurate, rewarding the appropriate behavior 96 percent of the time. But the human trainer was better - with a 100 percent accuracy rate.

However, while the average response time was about the same for both algorithm and trainer, there was a lot of variation in the time of response from the trainer. The algorithm was incredibly consistent.

"This study was a proof of concept, and demonstrates that this approach works," Bozkurt says. "Next steps include teaching dogs to perform specific behaviors on cue, and integrating computer-assisted training and human-directed training for use in various service dog applications."

The paper, "Balancing Noise Sensitivity, Response Latency, and Posture Accuracy for a Computer-Assisted Canine Posture Training System," is published in a special issue of the International Journal of Human-Computer Studies, which focuses on animal-computer interaction. Co-lead authors of the paper are John Majikes and Rita Brugarolas, who are

"Next steps include teaching dogs to perform specific behaviors on cue, and integrating computer-assisted training and human-directed training for use in various service dog applications."

Ph.D. students at NC State. Co-authors include Dr. Barbara Sherman, a clinical professor of animal behavior at NC State; Michael Winters, Sean Mealin and Katherine Walker, Ph.D. students at NC State; Sherrie Yuschak, a clinical technician in NC State's College of Veterinary Medicine; and Pu Yang, a former Ph.D. student at NC State who now works for IBM. This work was supported by the National Science Foundation under grant number 1329738.

Story by Matt Shipman

THE LATEST NEWS FROM UNIVERSITY **ECE DEPARTMENTS**

Read ECE news articles at charge.ece.ncsu.edu

ECE Team Wins Spectrum-Sharing Radio Contest

Soaring by 16 other teams from around the world, a team of students from NC State's Department of Electrical & Computer Engineering emerged the winner of the Spectrum-Sharing Radio Contest hosted at Virginia Tech.

The team, advised by ECE professor Dr. Mihail Sichitiu and Dr. Muhammad Shahzad (Computer Science) competed in two phases of the competition prior to the finals. Dubbed "Team Dinamico," the team comprised four ECE graduate students - Sameera Magapu, Venkata Nagasree, Arya Venkatagiri, and Srikar Potta.

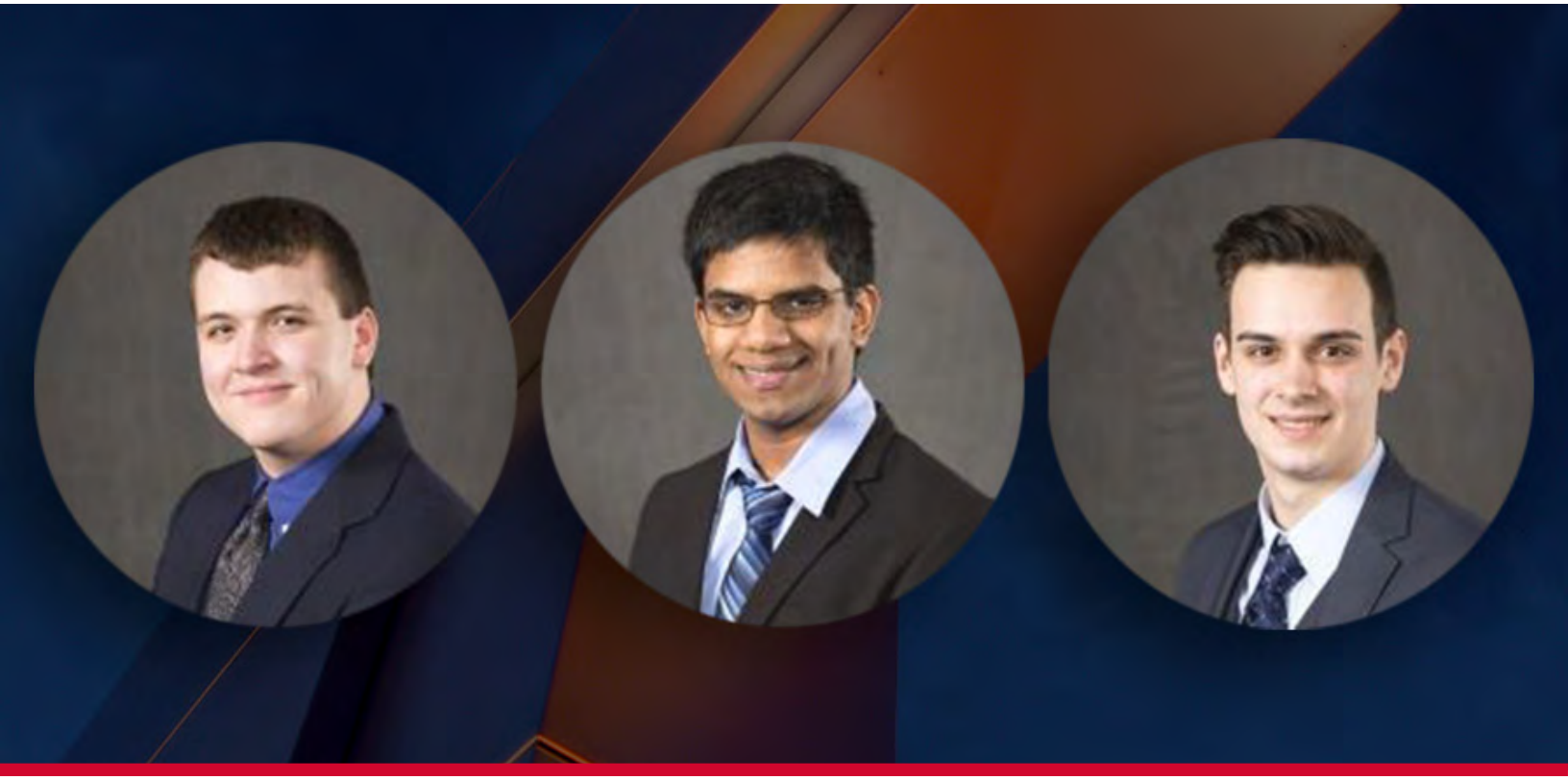
In Phase 1, teams' source-code submissions were tested in signal environments generated by the contest organizers including ones with ambient interference and noise, and scenarios that introduced interference signals with varying characteristics. In Phase 2, the teams' radio/controller combinations were tested in scenarios that included primary user links, requiring contestants to transmit error-free packets while minimizing interference to the primary user link.

Backed by a Motorola Solutions Foundation Innovation Grant, Virginia Tech's Bradley Department of Electrical and Computer Engineering, and the Wireless @ Virginia Tech research group, the purse for the winning team of the student design challenge was $5,000 in prize money.

Story by Charles Hall

Three Park Scholars for the Class of 2020 select ECE

North Carolina State University's Park Scholarships program has named 40 students to its Class of 2020, with three of them selecting to study in ECE.



"Twenty years ago, NC State named its first 25 Park Scholars - the Class of 2000," said Park Scholarships director Eva Feucht. "Two decades and nearly seventeen classes of graduates later, the Park Scholarships have created a vibrant network of leaders who are creating meaningful and lasting change in service to society, and we are excited to welcome the 1,000th Park Scholar to their ranks. Our alumni include scores of health care providers, lawyers, educators, entrepreneurs and business leaders, nonprofit personnel and public servants, designers, architects, scientists, engineers, members of the U.S. Armed Services, and much more. The Class of 2020 joins a thriving community."

Two students from North Carolina (Amalan Krishna and Iyengar Jonathan Schertz) and one from Ohio (Jonathan Jeffrey Reese) proudly join the ranks of the Park Scholars and will be arriving this fall in the halls of Electrical & Computer Engineering to demonstrate their leadership qualities as they pursue their studies.

The new class was selected from a record-setting pool of just over 2,000 outstanding applicants from 42 states and 97 of North Carolina's 100 counties. A selection committee comprising more than 300 dedicated and talented NC State alumni, faculty and friends conducted application review, interviews and outreach.

Story by Charles Hall

Garcia one of 31 NC State students to score NSF Fellowships

In a hallmark success for NC State, a record-breaking 31 students received Graduate Research Fellowships from the National Science Foundation this year. Of those, an impressive ten engineering students, including Kristen Garcia, a graduate student in Electrical Engineering, were honored as Fellows.

Garcia, who received her Bachelor of Science in Engineering Physics from Murray State University, Kentucky in 2015, is working towards her Ph.D. in Electrical Engineering at NC State.

"I look forward to designing the fourth generation Solid State Transformer within FREEDM," Kristen Garcia adds, "continuing to pursue K-12 STEM outreach, and supporting other rural university students as they consider graduate school."

Story by Charles Hall

ECE Student one of 5 NC State Fulbright Scholars

Five NC State students, including Alex Starnes from Electrical and Computer Engineering will head off around the globe as winners of prestigious Fulbright grants for the 2016-17 academic year. As Fulbright Scholars, they'll teach and conduct research in fields ranging from chemistry to architecture at sponsoring institutions in Europe, South America and Africa.

Alex Starnes, a senior in electrical and computer engineering with a minor in Spanish, will serve as a teaching assistant in Spain. He has completed internships at Boeing and Eastman Chemical, served as president of the Sigma Phi Epsilon fraternity and is active in Eta Kappa Nu, the electrical and computer engineering honors fraternity.

Story by University Communications

Grants, alumni success
and research awards

We report on it all at **Charge!**

READ ECE NEWS ARTICLES AT CHARGE.ECE.NCSU.EDU »

Lobaton and Bozkurt receive NSF CAREER Awards

The NSF CAREER award is one of the most prestigious awards in support of junior faculty members who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations.

Assistant Professor Dr. Edgar Lobaton, (left) and Associate Professor Dr. Alper Bozkurt (right), both professors in the Department of Electrical and Computer Engineering at North Carolina State University, have received Faculty Early Career Development Awards from the National Science Foundation (NSF).

Edgar Lobaton's project, "Data Representation and Modeling for Unleashing the Potential of Multi-Modal Wearable Sensing Systems," will receive $492,109 in funding over five years from the NSF in recognition of this award. This research is supported by the NSF's Division of Cyber-Physical Systems (CPS).

> **"The goal of this project is to develop a computational framework ... with the objective of enabling users to efficiently change their behavior"**

The goal of this project is to develop a computational framework that unleashes the potential of physiological and environmental multi-modal wearable systems and aims to develop methodology for the estimation and prediction of physiological responses and environmental factors, with the objective of enabling users to efficiently change their behavior. Lobaton's research will accomplish this by using the framework to build on tools from statistical analysis, topological data analysis, optimization theory and human behavior analysis.

Lobaton received a B.S. degree in electrical engineering and mathematics from Seattle University (2004) and a Ph.D. in electrical engineering and computer sciences from the University of California, Berkeley (2009).

Alper Bozkurt's project, "Bio-electro- photonic Microsystem Interfaces for Small Animals," will be awarded $500,000 over five years in recognition of the NSF CAREER Award. The research is supported by NSF's Division of Electrical, Communications and Cyber Systems.

> **"MicroSystems offers new engineering opportunities to solve real life problems"**

"MicroSystems offers new engineering opportunities to solve real life problems. By fusing biological organisms with synthetic electronic systems, a quantum leap can be enabled in our ever-lasting engineering struggle to mimic relatively more complicated properties of biological machines, such as autonomy, intelligence, and biocomplexity observed across various length scales. The proposed microsystem will open a physiological window to improve understanding of the physiology of small animals in their natural environment. The unique interdisciplinary and hands-on nature of this project will help us to reach out to all citizens - including women and men, underrepresented minorities, and persons with disabilities -- and train them to use bioelectronics, biophotonics, and wearable wireless physiological systems."

Bozkurt received his PhD in Electrical and Computer Engineering from Cornell University in 2010. He joined the NC State faculty later that year.

Story by Dan Green and Charles Hall

Baliga's Book Wins 2016 PROSE Award

Dr. Jay Baliga's book "The IGBT Device: Physics, Design and Applications of the Insulated Gate Bipolar Transistor" won the 2016 PROSE Award and first place prize in the Engineering & Technology category.

The PROSE Awards were announced February 4th at the annual conference of the Association of American Publisher's Professional and Scholarly Publishing Division in Washington, DC. PROSE honors the best in professional and scholarly publishing, as judged by peer publishers, librarians, academics and medical professionals.

Baliga, an ECE faculty member and director of NC State's Power Semiconductor Research Center and a distinguished professor of Electrical and Computer engineering, is renowned for his invention of the insulated-gate transistor or IGBT, a power semiconductor device primarily used as an electronic switch in modern appliances, from electric cars to air conditioners. The improved efficiency gained by using the IGBT has resulted in saving over 1 trillion gallons of gasoline and reducing electrical energy consumption by more than 50,000 terra-watt- hours (equivalent to not having to build 600 one-gigawatt coal-fired power plants).This has saved consumers $15 trillion while reducing carbon dioxide emission by more than 75 trillion pounds.

Competition was "fierce" this year, according to AAP, with the competition attracting a record 551 entries of books, reference works, journals and electronic products in more than 54 categories.

Story by Dan Green

Rotenberg Receives the 2015 Micro Test-of-Time Award

Prof. Eric Rotenberg and co-authors Steve Bennett and Jim Smith received the 2015 Micro Test of Time Award, for their paper: "Trace Cache: A Low Latency Approach to High Bandwidth Instruction Fetching" from the Proceedings of the 29th IEEE/ACM International Symposium on Microarchitecture (MICRO-29), pp. 24-34, published in December 1996.

This award is "in recognition as One of the Most Influential Papers of the Symposium" in its 48-year existence. The Micro Test of Time Award recognizes an influential MICRO paper whose influence is still felt 18-22 years after its initial publication.

The MICRO-29 paper by Rotenberg, Bennett, and Smith proposed a practical mechanism, called the trace cache, for fetching many instructions in parallel in spite of frequent branches. The trace cache influenced much follow-on research and development on instruction fetch mechanisms, but also enabled other optimizations and even whole new microprocessor architectures, including trace processors. A trace cache was implemented in the Intel Pentium-4 microprocessor and similar mechanisms exist in contemporary microprocessors. The MICRO-29 paper has been cited 648 times according to Google Scholar.

Story by Dan Green

Nagle and Misra named Distinguised Professors

Professors Nagle (left) and Misra (right)

Dr. Troy Nagle and Dr. Veena Misra have been named Distinguished Professors of Electrical and Computer Engineering. This is the culmination of a process that included recommendations by a committee of peers, and approval by the Dean, Provost, and Chancellor.

Misra has made significant contributions to the University, not the least of which has been leading the proposal effort for the ASSIST Center, and subsequently leading it successfully through its last critical review and renewal. Misra's awards and recognitions include the 2001 NSF Presidential Early CAREER Award (PECASE), the 2002 ALCOA Research Achievement Award, the 2007 NCSU Alumni Research Award, and the 2011 ALCOA Distinguished Research Award. She was elected IEEE Fellow in 2012.

Among Nagle's many contributions to the University, he was founding Head of the Biomedical Engineering Department. He was a recipient of the IEEE Centennial Medal in 1984, the IEEE Richard M. Emberson Award in 1998, the IEEE Millennium Medal in 2000, and the Alexander Quarles Holladay Medal for Excellence from NC State in 2008. He was elected Fellow of the IEEE in 1983, was elected to the IEEE Computer Society's Golden Core in 1996, and named Fellow of the American Institute of Medical and Biological Engineering in 1998, He served as President of the IEEE in 1994, and was President of the IEEE Sensors Council in 2014-15.

Story by Charles Hall

Floyd receives 2016 Outstanding Teacher Award

Each year, six members of NC State's faculty join the ranks of the Academy of Outstanding Teachers upon receiving the Outstanding Teacher Award. This year, selected by the Senior Class Council, Dr. Brian Floyd, Associate Professor of Electrical & Computer Engineering was recognized with the Award for his excellence as a teacher and mentor.

Prior to arriving at NC State, Floyd led a distinguished career at IBM Research where his work included the demonstration of some of the world's first 60-GHz transceivers in silicon and the development of 60-GHz phased-array transceivers, antennas, and packages. Building on his experience, his teaching responsibilities include ECE 511 (Analog Electronics) and ECE 712 (Integrated Circuits for Wireless Communications).

"It is a privilege to work and teach at NC State, and this award is an incredible honor," expressed Floyd on receipt of this latest award. While at NC State, he has been recognized with multiple awards, including his receipt last year of the William F. Lane Outstanding Teacher Award.

The Outstanding Teacher Award recognizes excellence in teaching at all levels, and recipients are then eligible to receive the Board of Governors Award for Excellence in Teaching and the Alumni Distinguished Professor Award.

Story by Charles Hall

Cirrus Logic Continues to Invest in the College and in Electrical Engineering

When Dr. Jason Rhode was applying to graduate programs in electrical engineering, he was accepted by several schools. But one stood out.

"NC State really went out of their way to make sure I knew that they wanted me to come there," Rhode, who earned master's and Ph.D. degrees in electrical engineering in Raleigh, said.

Rhode is now president and CEO of Cirrus Logic, a premier supplier of high performance, low-power integrated circuits for audio and voice signal processing applications based in Austin, Texas.

He says NC State, and the College of Engineering, continue to stand out. His company has built a strong relationship with the College and particularly the Department of Electrical and Computer Engineering. Rhode has returned to campus to talk to ECE undergraduates about the value of earning a graduate degree and spoke to engineering and computer science freshmen at the 2015 College of Engineering Welcome. Cirrus Logic recruits heavily from ECE, for both interns and full-time employees.

The department's master's degree track in circuit design applies particularly well to Cirrus' work processes. "We can hire people out of there with a master's degree and they can really hit the ground running," Rhode said.

Cirrus Logic is continuing to invest in ECE by creating a Distinguished Professorship and Term Professorship with a total gift of $708,106. Utilizing the Distinguished Professors Endowment Trust Fund, which was established in 1985 by the North Carolina General Assembly, the goal is to receive the state match of $334,000 to then establish a $1,000,000 distinguished professorship.

The company also created the Cirrus Logic Michael L. Hackworth Design Fellowship Program in 2013, which provides an award of $80,000 over two years and an internship opportunity to ECE students interested in mixed signal circuit design. In 2015, Cirrus Logic made a $100,000 commitment for discretionary support to provide the department with the resources needed to have optimal flexibility and respond to opportunities and challenges quickly.

Sensus Reach Scholarship Established for NC State University's College of Engineering

Julien Chomette (left) and Vijay Thiagarajan (right)

Rising upperclassmen attending North Carolina State University's (NC State) College of Engineering have a new avenue for financial assistance through the recently-established Sensus Reach SM Scholarship. Raleigh, NC-based technology leader, Sensus has made a $100,000 donation to the Department of Electrical and Computer Engineering to support the scholarships.

The scholarship is a merit and need-based award open to rising juniors or seniors majoring in electrical and/or

computer engineering. Sensus Reach Scholars will receive a one-year stipend to cover tuition and fees. Two students, Vijay Thiagarajan and Julien Chomette, were selected as the 2016 Sensus Reach recipients.

"We're fortunate that NC State, one of the top engineering schools in the nation, is training tomorrow's innovators right here in our community," said Sensus Chief People Officer Todd Boyle. "Acquisition and development of key technical resources is critical to our success. This partnership is right for our business and for the community."

"We are very pleased and enthusiastic to partner with Sensus. The real winners are the recipients, and we are grateful to Sensus for providing this opportunity to our deserving students," commented Dr. Daniel Stancil, Alcoa Professor and head of the Department of Electrical and Computer Engineering.

Story by Heather Daughtridge

Alumnus Endows Scholarship for Veterans

There are many different paths to success. Just ask Mark Carter. The youngest of seven children from Alamance County, NC, he married Dawn, his high school sweetheart. Once married, they both joined the Marines, heeding her father's advice to learn a skill in the military. The couple trained at the 29 Palms Marine Corps base in California and spent most of their enlisted time at Marine Corps Air Station Cherry Point in Havelock, NC, as electronic technicians.

They returned home after four years of honorable service. Dawn enrolled at UNC Greensboro to study interior architecture and history and Mark paid a visit to William Easter, a professor in electrical engineering at NC State, to ask for his help.

Dawn Carter and Mark Carter

The Marine Corps had changed him - he was more focused and mature. Not only had he learned a lot about electronics, but a great deal about himself as well.

"I'm a veteran," he told Easter. "My service has prepared me for greater challenges. Would you give me an opportunity?" Easter did.

Mark Carter completed his electrical engineering degree and worked for three companies before starting his own electrical contracting company in Raleigh. Wells Global installs backup power systems for federal agencies, including the Federal Aviation Administration and the Department of Defense, and employs 38 people, including several NC State engineers.

The Carters decided to endow a scholarship that would support an undergraduate engineering student who is also a veteran, preferably one interested in electrical engineering. They named the scholarship after Mark Carter's mother, Mary Gammon Carter, a tough textile worker who left a legacy of hard work and strong family values.

Mark Carter credits his mother, who instilled discipline, a little stubbornness and the ability to work hard, for his career success. "The military gave me the confidence and NC State gave me an opportunity to prove myself," he said.

Veliadis Named PowerAmerica CTO

Victor Veliadis, a senior advisory engineer for Northrop Grumman Electronic Systems, has been named the chief technology officer for PowerAmerica, the public-private power electronics institute hosted on Centennial Campus.

"We are extremely fortunate to have someone of Dr. Veliadis's stature and knowledge join PowerAmerica," said PowerAmerica executive director Gen. Nick Justice. "He has a tremendous track record of accomplishment in the research and development of power semiconductor devices and brings a wealth of experience."

In his capacity as senior advisory engineer at Northrop Grumman, Veliadis led efforts in the design, fabrication, and testing of various wide bandgap devices and was principal investigator (PI) and program manager for a number of federal programs, including the U.S. Army's TARDEC Big Area SiC Switch and the U.S. Army Research Lab's High Temperature SiC Power Electronics programs. He also designed SiC Avalanche Photodiodes for solar blind Geiger mode applications.

Veliadis has been awarded 23 patents for his work and has numerous patent applications pending. Veliadis has also been an adjunct physics professor at Ursinus College and St. Joseph's University and a post-doctor research fellow, research assistant and instructor at Johns Hopkins University. Veliadis received his Ph.D. and M.S. degrees in electrical and computer engineering from Johns Hopkins University and an M.S. degree in electrical engineering from the National Technical University of Athens.

PowerAmerica is tasked with implementing critical wide bandgap power electronics technologies, sparking early commercialization, and nurturing the U.S. wide bandgap semiconductor industry through education programs and training.

Story by University Communications

Franzon new ECE Director of Graduate Programs

Dr. Paul Franzon has assumed the position of Director of Graduate Programs in ECE.

An IEEE Fellow and Distinguished Professor in the ECE Department, Paul is an expert in constructing silicon microsystems for applications in computing, communications, sensors, robotics, and signal processing. He has received numerous recognitions for his research and graduate teaching, including ECE Graduate Teacher of the Year Awards in both 2005 and 2007, the College of Engineering Alcoa Research Award in 2005, and the College of Engineering Board of Governor's Award for Excellence in Teaching in 2014. In addition, he has advised 55 completed PhD Theses.

Prior to arriving at NC State in 1989, Dr. Franzon obtained his PhD from the University of Adelaide in Australia, and was an engineer at the Australian Defence Science and Technology Organization while serving as an officer in the Australian Army Reserve.

"Dr. Franzon brings significant experience and energy to this position, and we look forward to his leadership," remarked Dr. Dan Stancil, Alcoa Professor and head of the Department of Electrical and Computer Engineering.

Story by Charles Hall

ECE Alumni Spotlight

Edd H. Lovette III, P.E., NCSU BSEE '03

PowerSecure, Inc., Engineering Operations Manager

Greatest professional accomplishment

I have the honor of being the Professional Engineer of Record for the design for the Cates Avenue 11-MegaWatt Power Plant, and have been heavily involved in the expansion of all three electrical substations on the University's campus. It is a great feeling to know that I am helping to keep the lights on to my Alma Mater.

What first attracted you to NCSU and the College of Engineering?

My dad and uncle are also graduates of NC State's Electrical Engineering program. I was constantly surrounded by Wolfpack growing up, and it only felt natural to continue in the family's footsteps. There was never a question of what school I would attend – I filled out only one college application.

Why did you choose to study ECE?

I had an interest in tinkering with computers when I was young. I started off in the Computer Engineering program but soon realized that power generation and distribution is much more fascinating. Turning on a 5VDC chip is fairly uneventful, but watching a power plant start up for the first time is an absolute thrill!

What was your favorite ECE course?

ECE451. During the telecom boom of the early 2000's, everyone was interested in digital communications and microprocessors. These classes would have 80-100 people in the lecture halls. A small group of us wanted to pursue a power oriented career and had to petition Dr. Grainger to even offer ECE451. We ended up with around 12 of us in the class.

How have your experiences at NCSU helped you in your professional and personal life?

The College of Engineering without a doubt prepares you to better understand the theory behind all of the engineering decisions we make on a day-to-day basis. The practical application of knowledge is learned on the job, but the theory is critical to making the most of your engineering career.

What advice do you have for current students who want to make the most out of their experiences at NCSU and ECE?

Take advantage of the CO-OP program. I was a CO-OP student and participated in a work/school rotation every other semester. It was invaluable to my decision to pursue a career in power. Plus, when I graduated, I already had a year of credit towards my Professional Engineer (PE) license.

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NC STATE Engineering

North Carolina State University
Department of Electrical and Computer Engineering
Campus Box 7911
Raleigh, NC 27695-7911

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