



Dr. David Howell
Head of the ECE Department

Our students and faculty continue to be involved in and recognized for work that has a significant impact. I thought you would enjoy hearing about some of the news stories associated with people in our department, so we've assembled a sampling of highlights from the past year. Our undergraduates have been involved in activities ranging from leading prize-winning teams in the Disney ImagiNations and NASA Robotics Academy competitions to traveling to Egypt and Tunisia to understand and interpret the Arab Spring in terms of poetry. An outstanding undergraduate alumnus who went on to graduate school at the University of Washington has been recognized by the White House as a "Champion of Change," and one of our present PhD students has won an international ACM Student Research Competition. Finally, our young faculty have received outstanding recognitions from NSF and DARPA; our senior faculty have received recognitions from IEEE, AAAS and the White House; and research in the NSF FREEDM Center was recognized as one of the top 10 emerging technologies. I hope you enjoy these stories as much as I have!

Dr. David Howell

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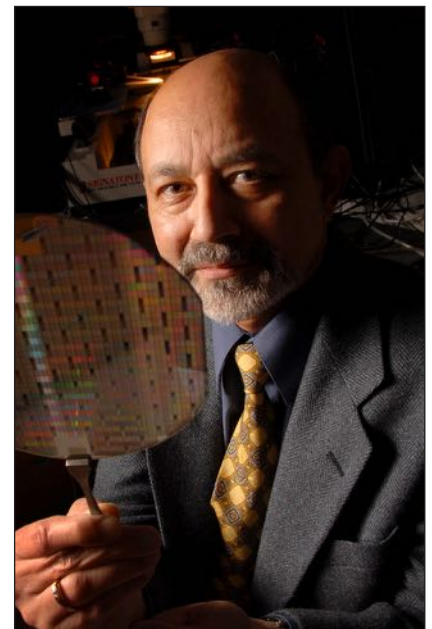
Baliga Wins Nation's Highest Honor For Technology Innovation

www.ece.ncsu.edu/news/19425

President Barack Obama has awarded the National Medal of Technology and Innovation to North Carolina State University professor Dr. B. Jayant Baliga. The medal is the nation's highest honor for technological achievement.

Baliga, a Distinguished University Professor of Electrical and Computer Engineering, was honored for inventing, developing, and commercializing the Insulated Gate Bipolar Transistor (IGBT).

The IGBT improves energy efficiency by more than 40 percent in an array of products, from cars and refrigerators to light bulbs, and it is a critical component enabling modern compact cardiac defibrillators. The impact of the improved efficiency of IGBT-enabled applications has been a cumulative cost savings of \$2.7 trillion for U.S. consumers and \$15.8 trillion for worldwide consumers over the last 20 years. At the same time, the improved efficiency produced by IGBT-enabled applications has produced a cumulative reduction in carbon dioxide emissions of 35 trillion pounds in the U.S. and 78 trillion pounds worldwide over the last 20 years. In addition, IGBT-based compact portable defibrillators are projected to have saved nearly 100,000 lives in the United States.



"It is a great honor to be recognized by the nation for my work over the last 35 years," Baliga says. "It's wonderful to see power semiconductor technology recognized for its enormous contribution to improving the quality of life for society, while mitigating our impact on the environment. And while much has been accomplished, I am continuing my work in the area of renewable energy systems."

Steer Receives Distinguished Educator Award

www.ece.ncsu.edu/news/18531

Dr. Michael Steer has been awarded the 2011 Distinguished Educator Award from the IEEE Microwave Theory and Techniques Society (MTT-S) for "outstanding contributions as a teacher, mentor, and role model for students in the microwave profession."



Every year the MTT Society presents awards to outstanding members of the microwave community for contributions made to the field of microwave technology and engineering. The awards are made following a process that includes nomination and a rigorous evaluation procedure.

The award recognizes a distinguished educator in the field of microwave engineering

and science who best exemplifies the special human qualities of Fred Rosenbaum. Rosenbaum considered teaching a high calling and demonstrated his dedication to the Society through tireless service. The award was conferred at the annual Society Awards Banquet held during the 2011 International Microwave Symposium.

ECE Undergraduate Wins MSFC Robotics Academy Award

www.ece.ncsu.edu/news/17067

Taylor Courier, a junior in Computer Engineering, along with his team members has been awarded a team excellence award at the Marshall Space Flight Center during the Intern Poster Expo. Taylor has spent his summer conducting robotics research at the NASA Marshall Space Flight Center as part of the NASA Robotics Academy.



Taylor's team won First Place (\$1000) in the Team Excellence category for their project. Entitled "Reconfigurable Computing Telepresence Robot," it involved the creation of a mobile robotic sensor platform for NASA with hardware level data processing capabilities. They were able to accomplish this by replacing the electronics and control system of a MARCbot, a military IED detection robot, with a Field Programmable Gate Array (FPGA) based control system. The robotic sensor platform can be controlled from a remote computer which transmits drive commands to the robot while receiving sensor data in return.

Creating Magic

www.ece.ncsu.edu/news/18742

Dreams turned to reality when a team of students from North Carolina State University traveled to Southern California as finalists in the Disney ImagiNations competition. The team's project, a Disney attraction called "Fantasia: The Lost Symphony," scored second place in the prestigious competition.



The team members brought a diverse set of skills to the demanding endeavor. Patrick Carroll is a senior in electrical and computer engineering, Adam Newton is majoring in industrial and systems engineering with a minor in creative writing and Jay Brown and Michael Delaney

just graduated with undergraduate degrees in art and design.

In addition to pitching their concept to a panel of imagineers, the students got to spend a week at Imagineering's headquarters, meeting some of Disney's brightest minds and taking a peek at the technology behind Disney magic.

"Going back stage [at Soarin' Over California] allowed us to really appreciate the magic on the screen," said Newton.

Hearing that brought a smile to the face of Elena Page. As an undergraduate in engineering at NC State in 1995, Page took first place in the ImagiNations competition and went on to work at Imagineering for nearly a decade. Her work on Soarin' Over California earned her the theme park equivalent of an Oscar.

Back in North Carolina with a job as an animator and senior designer at SMT in Durham, Page was happy to volunteer as a mentor for the team. "It's a difficult contest," she says, "it's getting harder and harder to deliver an experience that is truly unique."

The students' project was inspired by Fantasia, Disney's 1940 animated film. They proposed creating a theme park attraction that would allow guests to conduct a new musical score and control various magical effects using their hands.

For the contest, they developed an exhaustive array of materials, including concept art, a storyboard, posters, a presentation, a scale model and an animation. To top it off, they even developed their own software program called Camera Manager and a working prototype of a device – a sorcerer's hand – that could be sold in Disney gift shops to promote the ride.

With the competition behind them, the students have a new sense of excitement about the future. "I've gotten this taste of creative innovation," says Newton. "Now I want to have a job like that, a job that makes people ask, 'You get paid to do that?'"

Ph.D. Student Wins ACM Student Research Competition

www.ece.ncsu.edu/news/17433

Niket K. Choudhary, advised by Dr. Eric Rotenberg, won first place in the ACM Student Research Competition for his work titled "FabScalar: Composing Synthesizable RTL Designs of Arbitrary Cores within a Canonical Superscalar Template". The competition was held at the 19th International Conference on Parallel Architectures and Compilation Techniques (PACT) in Vienna, Austria.

Niket is exploring heterogeneous multi-core architectures comprised of many superscalar cores, each customized to different application characteristics. By semi-automating the design of arbitrary superscalar cores, Niket's research promises to overcome the chief barrier to heterogeneous multi-core - the design and verification effort required for many different core designs.

White House honors ECE Alumnus as Champion of Change

www.ece.ncsu.edu/news/19150

Brian Ferris ('03) was one of a select group of Americans to be named a Champion of Change in the area of technology and innovation by the White House. Ferris was recognized for his work on open-source software and public transportation systems.

Ferris and his colleague David Emory worked with the Tri-County Metropolitan Transportation District of Portland to develop a multi-modal trip planner. The open-source planner is continually being enhanced by transit agencies around the globe.

The Champions of Change series profiles the lives of Americans who are playing a role in helping the United States rise to the challenges of the 21st century. "The White House is proud to feature these stories of Americans who are doing extraordinary things in their communities to out-innovate, out-educate, and out-build the rest of the world," said Valerie Jarrett, senior advisor to the President.

Summer of the Arab Spring

www.ece.ncsu.edu/news/18525

Mohammad Moussa, an electrical and computer engineering major, and Sameer Abdel-Khalek, a student in the environmental technology program, traveled to Tunisia and Egypt this summer with award-winning poets Kane Smego and Will McInerney.

"People have brought about change, and they've done it peacefully, respectfully and in such an organized way. And they've done it all through their voices," Moussa said. "As someone who writes poetry, it's extremely inspiring to see that, to see the voice winning in such a huge struggle."

"The region has been oppressed for so long and across so many generations that you lose sight of the fact that people are actually able to take matters into their own hands," he said. "It's great to see people out on the street, using their voices to say they want a better life, they want change."

Escuti Wins Presidential Award For Young Scientists And Engineers

www.ece.ncsu.edu/news/19412

Dr. Michael Escuti, associate professor of electrical and computer engineering, will receive the Presidential Early Career Award for Scientists and Engineers later this fall, the White House announced Monday. The awards program, established by President Bill Clinton in 1996, honors researchers for working at the frontiers of science and technology and serving the community through scientific leadership, public education or outreach.

Escuti was honored for his pioneering development of liquid crystal "polarization gratings," which consist of a thin layer of liquid crystal material on a glass plate. The White House also recognized him



for educating students through collaborations with international academic teams and industries, as well as for outreach work in underserved communities.

Escuti's research has shown how polarization gratings can solve problems in optics that had been previously thought unsolvable. One result of the work is a very energy-efficient way of steering laser beams that is precise and relatively inexpensive. The research has potential applications in laser radar and free space communication. Escuti's team, consisting of NC State students along with partner Boulder Nonlinear Systems Inc., has already delivered prototypes of the technology to the U.S. Air Force and is working on other applications.

Additional Faculty Awards

Dr. B. Jayant Baliga

Inducted into Electronic Design Engineering Hall of Fame
www.ece.ncsu.edu/news/17702

Dr. Mesut Baran

Elevated to IEEE Fellow
www.ece.ncsu.edu/news/17792

Dr. Aranya Chakraborty

Received Faculty Early Career Development (CAREER) Award
www.ece.ncsu.edu/news/18127

Dr. Brian Floyd

Received DARPA Young Faculty Award
www.ece.ncsu.edu/news/19314

Dr. Robert Trew

Elevated to AAAS Fellow
www.ece.ncsu.edu/news/17918

Smart Transformers Among Top 10 Emerging Technologies

www.ece.ncsu.edu/news/18630

The smart solid-state transformers being developed by the NSF FREEDM Systems Center at North Carolina State University have been named to MIT Technology Review's 2011 list of the world's 10 most important emerging technologies.



“Smart grid technology could make electrical power more reliable, and make it easier to integrate renewables such as solar and wind. The smart transformer being developed at the NSF FREEDM Systems Center at NC State University represents a major advance for smart grids, allowing the flow of electricity to be controlled and rerouted in a manner similar to how data is routed around the Internet,” said Stephen Cass, special projects editor for the Technology

Review. “This rapid and precise control over electrical power could balance supply and demand better, eliminate spikes, and reduce the number of power plants required, as well as make it easier to support things like residential solar installations, or large fleets of hybrid and electric vehicles.”

Today’s power grid only lets power flow in one direction - from the power company to the consumer - and the transformers on today’s grid simply transfer electrical energy from one circuit to another and transform it to a more usable voltage.

But the smart transformers under development at FREEDM are more flexible and have components that are built to handle high power levels and quickly change power voltage and frequency as they communicate with the rest of the grid. The devices could allow electric vehicles to be charged more quickly and utilities to incorporate large amounts of solar and wind power into the grid without blackouts or power surges.

“We are honored that our work has been recognized during these exciting times in the electric power systems field,” said Dr. Alex Huang, the center’s director and the Progress Energy Distinguished Professor of Electrical and Computer Engineering at NC State. “Developing smart solid-state transformers will be crucial to improving power quality and reliability for residential users and industry customers and bringing more renewable energy onto the electricity grid.”

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