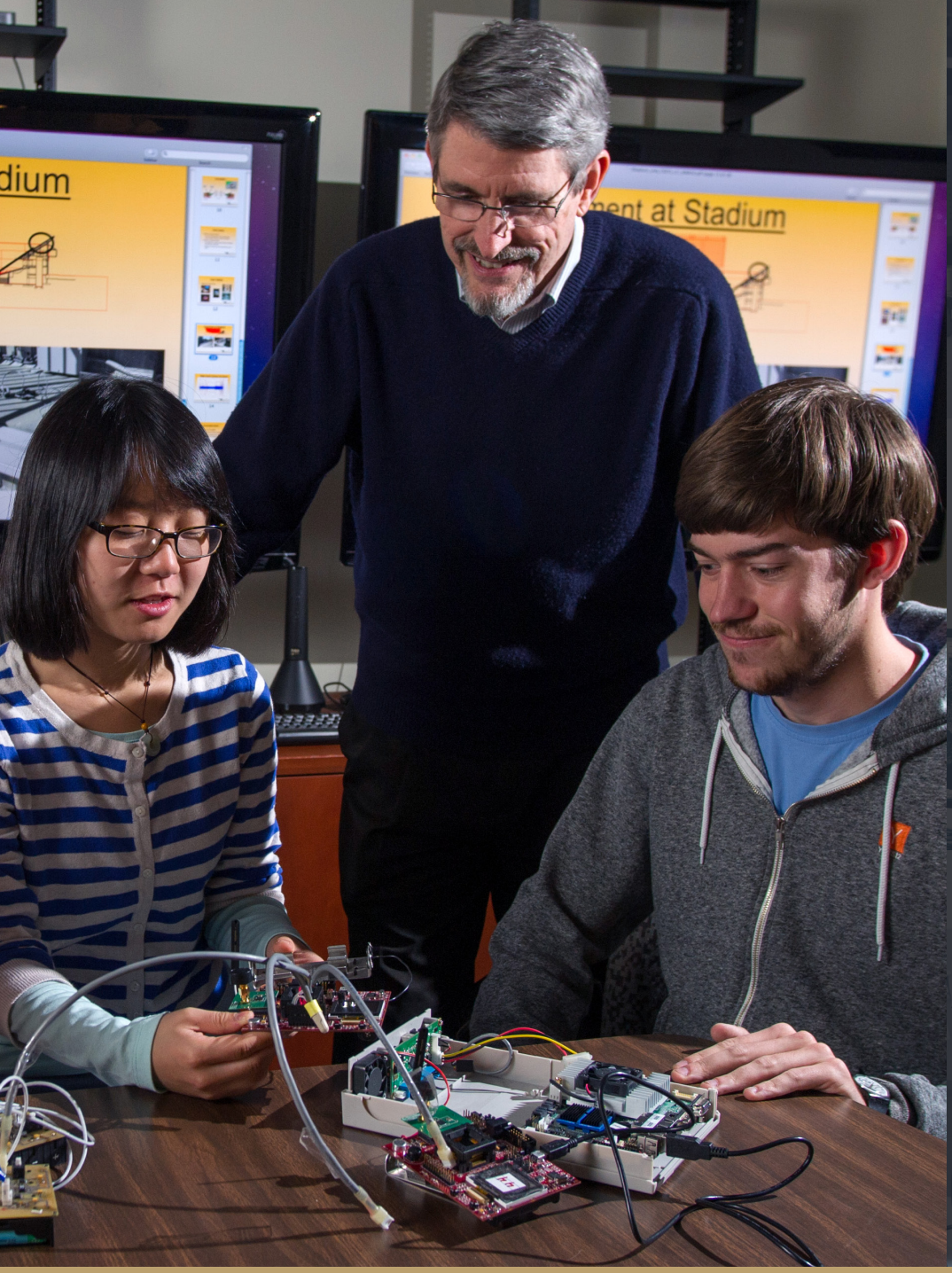
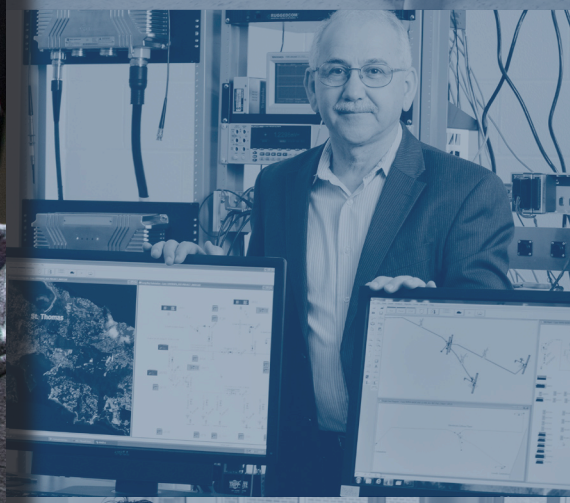




Georgia Tech School of Electrical and Computer Engineering

2012–2013 Annual Report

FROM THE CHAIR

I am very happy to share with you our achievements from fiscal year 2013. Having been at Georgia Tech for 18 years, I thought that I knew most of what there is to know about ECE and the campus. However, in my first year as school chair, I have learned so much from our students, alumni, corporate partners, faculty, and staff. And I am more convinced than ever that we are in the right place at the right time to impact education, research, and economic development in a big way.

The accomplishments of our faculty, staff, and students shone brilliantly in the last year, as they received the most prestigious honors given by Georgia Tech and by a diverse set of external groups. Our faculty members are making their marks in a wide range of research areas and blazing new trails in how we teach our students, both in person and online.

Our enrollments continue to rise, and we remain the largest producer of electrical engineers and computer engineers in the United States. We are firmly committed to increasing the diversity of our student body and training them so they can immediately contribute to their employers upon graduation or empower them to create their own jobs or companies.

We are in exciting and rapidly changing times for higher education, and I am convinced that our best days are yet to come in ECE at Georgia Tech. I invite our corporate and government partners, alumni, and friends to connect with us via Facebook and Twitter. Stay tuned as we continue to innovate and push the boundaries of engineering education and research with your support!

Sincerely,

Steven W. McLaughlin
Professor and Steve W. Chaddick School Chair

ECE OVERVIEW

The School of Electrical and Computer Engineering at Georgia Tech offers a broad array of research and educational programs that are solidly grounded in the basics of engineering and that are highly interdisciplinary. Our 11 technical interest groups include bioengineering, computer systems and software, digital signal processing, electrical energy, electromagnetics, electronic design and applications, microelectronics/microsystems, optics and photonics, systems and controls, telecommunications, and VLSI systems and digital design.

For fiscal year 2013, our undergraduate enrollment was comprised of 1,396 undergraduate students, with electrical engineering majors totaling 940 and computer engineering majors totaling 456. Female enrollment comprised 12 percent of the undergraduate population and underrepresented minorities comprised 17 percent. Graduate student enrollment totaled 1,128, with 16 percent of the enrollment consisting of females and seven percent consisting of underrepresented minorities.

Degrees Awarded

311
TOTAL UNDERGRADUATE DEGREES

238 B.S.E.E. + **73** B.S.Cmp.E.

8% female graduates
20% underrepresented minorities*

392
TOTAL GRADUATE DEGREES

290 M.S./M.S.E.C.E. + **2** M.S. in Bioengineering
97 Ph.D. + **3** Ph.D. in Bioengineering

15% female graduates
8% underrepresented minorities*

** All underrepresented minority percentages represent Black/African-American and Hispanic/Latino students.*

Rankings, U.S. News & World Report

No. 5
national ranking of
E.E. undergraduate program

No. 6
national ranking of
Cmp.E. undergraduate program

No. 5
national ranking of
E.E. graduate program

No. 5
national ranking of
Cmp.E. graduate program

FACULTY

In the last fiscal year, the School employed 113 academic faculty, 11 academic professionals, 63 research faculty, and 80 administrative staff. The School welcomed three new faculty members and honored the contributions of two professors who have made leading-edge contributions in the fields of microelectronics, telecommunications, and digital signal processing.

New Faculty

Mark A. Davenport
Assistant Professor
Digital Signal Processing

Arijit Raychowdhury
Associate Professor
VLSI Systems and
Digital Design

Alenka Zajic
Assistant Professor
Electromagnetics

Retired Faculty

Nikil Jayant
- John Pippin Chair in Wireless Systems and Georgia Research Alliance Eminent Scholar
- Director of the Georgia Tech Broadband Institute and Georgia Centers for Advanced Telecommunications Technologies
- Years of Service: 1998-2013

James D. Meindl
- Joseph M. Pettit Chair Professor in Microelectronics
- Director, Microelectronics Research Center and Founding Director, Nanotechnology Research Center
- Years of Service: 1993-2013

Faculty & Staff Awards

Our faculty and staff were honored with numerous awards from the campus community, including the highest accolade that a faculty member can receive from the Institute, the Class of 1934 Distinguished Professor Award. Two faculty members were elevated to Fellow status, and several others received honors from their professional societies, were named to leadership organizations, or were awarded funding by government agencies or industry for promising research.

EXTERNAL AWARDS

Farrokh Ayazi was elected as an IEEE Fellow.

Stephen E. Ralph was elected as an OSA Fellow.

Ayanna Howard was chosen for the 2014-2015 Defense Science Study Group.

Raheem Beyah was selected for the Leadership Atlanta Class of 2014.

Russell D. Dupuis received the Alexander von Humboldt Award.

Erik I. Verriest was named to the Royal Flemish Academy of Belgium for Science and the Arts.

Thomas G. Habetler received the IEEE Power Electronics Society Harry A. Owen Distinguished Service Award and the IEEE Industry Applications Society Gerald B. Kliman Innovator Award.

Azad Naeemi and **Ying Zhang** were selected for National Science Foundation CAREER Awards.

Moinuddin Qureshi and **Muhannad Bakir** were chosen for Intel Early Career Faculty Honors Program Awards.

Pictured left to right at the Georgia Tech Spring 2013 Commencement Ceremony are President G.P. "Bud" Peterson, Class of 1934 Distinguished Professor Award recipient John D. Cressler, Provost Rafael Bras, and Executive Vice President for Research Stephen E. Cross.

GEORGIA TECH AWARDS

Ali Adibi received the Outstanding Doctoral Thesis Advisor Award.

John D. Cressler was chosen for the Class of 1934 Distinguished Professor Award.

Ayanna Howard received the Class of 1934 Outstanding Interdisciplinary Activities Award.

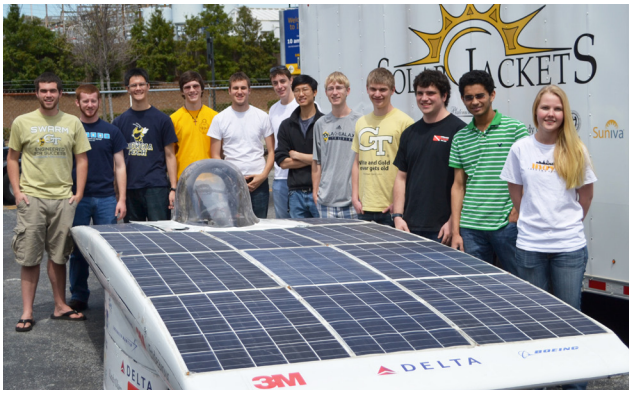
Abdallah Ougazzaden was selected for the Steven A. Denning Faculty Award for Global Engagement.

Christopher J. Rozell was chosen for the Center for the Enhancement of Teaching and Learning/BP Junior Faculty Teaching Excellence Award.

Etta Pittman received the Outstanding Staff Leadership Award and Women's Leadership Conference Staff Award.

STUDENTS AND STUDENT GROUPS

ECE student organizations work closely with the School's faculty and administrators on many different issues ranging from everyday student concerns to K-12 outreach to service to the greater community. While these student groups host many of their own professional development and social activities, they also unite to host several large school-wide events.



Student Groups

Eta Kappa Nu
IEEE
Women in Electrical and Computer Engineering
ECE Ambassadors

Our students also enthusiastically participate in and lead various engineering and science organizations, honor societies, and competition teams, including:

Georgia Tech Amateur Radio Club – W4AQL
Briaerean Honor Society
Energy Club
Engineers without Borders
National Society of Black Engineers
Society of Hispanic Professional Engineers
Society of Women Engineers
Solar Jackets
Tau Beta Pi

Award Winners

Our students were recognized with numerous awards during 2012-2013. Andrew Harris won a top national honor for his outstanding work as an intern with Microsoft, Allison Del Giorno received Georgia Tech's highest student accolade, and Layla Marshall was named as the Institute's top female engineering student. Our students won a host of other awards at the Georgia Tech Student Honors Day and at the annual Roger P. Webb Awards Program, and two of our student organizations also received well-deserved honors for their service to the ECE community, Georgia Tech, and the metro Atlanta area.

INDIVIDUAL AWARDS

Andrew Harris Academic Internship Student Achievement Award, given by the Cooperative Education and Internship Association

Allison Del Giorno Love Family Foundation Scholarship

Layla Marshall Helen Grenga Outstanding Woman Engineer Award

Sachit Kadle, Jason McElrath Henry Ford II Scholar Awards

Maysamreza Chamanzar, Suk Choi Georgia Tech Sigma Xi Best Ph.D. Thesis Awards

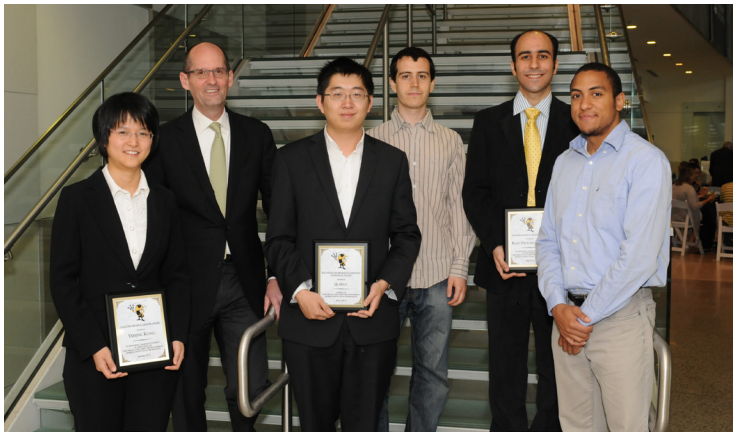
Penyen Chi ECE Undergraduate Research Award

Allison Del Giorno Outstanding Electrical Engineering Senior Award

Andrew Biviano Outstanding Computer Engineering Senior Award

Han Lun Yap, Qi Zhou ECE Graduate Research Assistant Excellence Awards

Amy LaViers ECE Graduate Teaching Assistant Excellence Award



STUDENT ORGANIZATION AWARDS

The **Beta Mu Chapter of Eta Kappa Nu** received an Outstanding Chapter Award for the eighth consecutive year.

Women in Electrical and Computer Engineering received the IEEE Women in Engineering Student Branch Affinity Group of the Year Award.

Many student award winners from ECE are pictured to the right with Steven W. McLaughlin, Steve W. Chaddick School Chair.

RESEARCH AND EDUCATION HIGHLIGHTS

Improved Hearing Anticipated for Implant Recipients

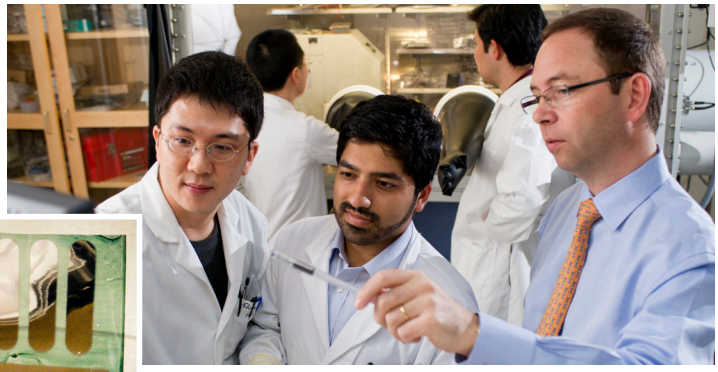
ECE Assistant Professor Pamela T. Bhatti and her research team have developed a new interface between a cochlear implant and the brain that could dramatically improve the sound quality of the next generation of implants. She and her team have also invented an insertion method that protects the implant and serves as a guide for surgeons to ensure proper placement. This work is being done in collaboration with Georgia Regents University.

Tech Establishes Research Center with Saudi Engineering University

Georgia Tech has established a joint research center — the Center for Energy and Geo Processing — with King Fahd University of Petroleum and Minerals (KFUPM) in Saudi Arabia that facilitates research and academic collaborations, personnel exchanges, and industry partnerships between the two institutions. ECE Associate Professor Ghassan AlRegib serves as director at Tech, and Associate Professor and Electrical Engineering Department Chair Ali Al-Sheikhi serves as director at KFUPM. Research focuses on applying advanced signal processing theories to energy-related signals and systems, with an emphasis on seismic data acquisition, processing, imaging, and interpretation.

Trees Used to Create Recyclable, Efficient Solar Cell

Georgia Tech and Purdue University researchers have developed efficient solar cells using natural substrates derived from plants and trees. By fabricating them on cellulose nanocrystal substrates, the solar cells can be quickly recycled in water at the end of their life cycle. Led by ECE Professor Bernard Kippelen, the technology was published in the March 2013 edition of *Scientific Reports*, the latest open-access journal from the Nature Publishing Group, and opens the door for a truly recyclable, sustainable, and renewable solar cell technology.



COMMERCIALIZATION

ECE has founded many successful startup companies through the Advanced Technology Development Center and currently has 20 opportunities under evaluation by VentureLab. ECE faculty and students were issued 32 patents in FY 2013.

The School's commercialization ambitions now extend to Georgia Tech-Lorraine with the groundbreaking of the Lafayette Institute *(rendering pictured at left)*, a $37 million facility dedicated to technology transfer of optoelectronics applications. The Lafayette Institute is scheduled to open in May 2014.

ECE will also launch an exciting, student-focused entrepreneurship initiative, the Center for Engineering and Technology Entrepreneurship (CREATE), in 2013-2014. This resource will be available to all Georgia Tech students.

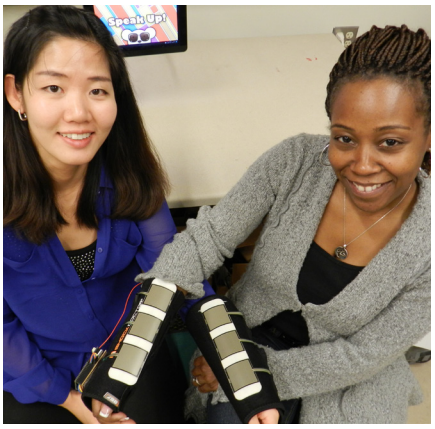
ECE Faculty Take on the MOOC Challenge

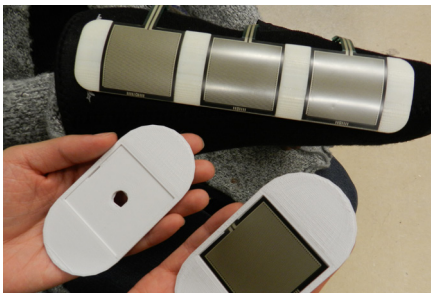
Magnus Egerstedt, Schlumberger Professor in ECE, was among the first Georgia Tech faculty members to teach massive open online courses (MOOCs) offered through Coursera. His course, "Control of Mobile Robots," was offered in January 2013, with more than 40,000 students registered worldwide and nearly 4,300 students successfully finishing the course. More MOOCs from ECE faculty members will be offered in 2013-2014, including "Linear Circuits" taught by ECE Professor Bonnie Ferri, who also serves as the School's associate chair for Undergraduate Affairs. Professors Ferri and Egerstedt are among a group of Tech faculty who are experimenting with using MOOCs for both off-campus audiences and on-campus classes.

Experiments Reinforce Classroom Concepts

As part of the new ECE curricula that took effect in 2012-2013, portable experimental devices were integrated into six sophomore- and junior-level lecture-based courses focused on digital logic design, circuits, electronics, and signals and systems. Students also use these devices on their own time to reinforce concepts learned in class, and they have responded positively to these new tools. ECE has become a national leader in developing experiments and curricula that integrate these portable devices into lecture-based courses, thanks to the Teaching Enhancement via Small-Scale Affordable Labs Center, which is led by Professor Bonnie Ferri.

Access4Kids Helps Children with Disabilities Access Tablets





Ayanna Howard, the Motorola Foundation Professor in ECE, is trying to open the world of tablets and smart phones to children whose limited mobility makes it difficult for them to perform the common pinch and swipe gestures required to control the devices. She and her team have created Access4Kids, a wireless input device that uses a sensor system to translate physical movements into fine-motor gestures to control a tablet.

TO READ THE FULL TEXT OF THESE STORIES AND MANY MORE, VISIT *www.ece.gatech.edu/media/news*

ECE Teams Advance to 2013 InVenture Prize Finals

Two teams with students from ECE — BioPIN and Spark — were among the six finalists for the 2013 InVenture Prize, with BioPIN claiming the People's Choice Award, consisting of a $5,000 prize. The event took place March 13 at the Ferst Center for the Arts on the Georgia Tech campus and was broadcast live on Georgia Public Television.

BioPIN collects and verifies PINs by building a digital fingerprint of how a user enters the data on a smartphone. Team members *(pictured at right, top)* were Scott Groveman, an electrical engineering major from Roswell, Ga., and Steven Wojcio, a computer science major from Forsyth, Ga.

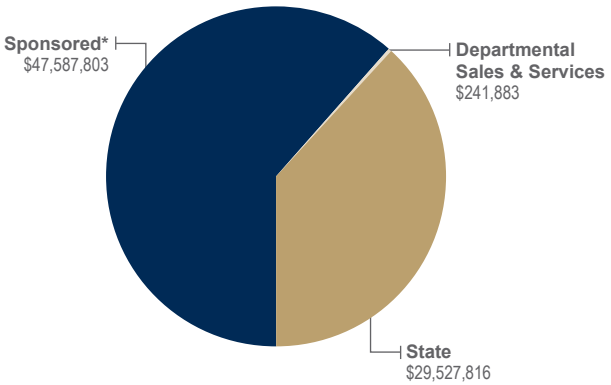
Spark is a credit card-sized cell phone wall charger that fits in your wallet for convenient charging at any time, any place. Team members were Sam Elia *(pictured at right, below)*, an electrical engineering major from Augusta, Ga., and Grant Heffley, a business administration major from Lawrenceville, Ga.

FINANCES

The School of Electrical and Computer Engineering spent $77,357,502 from state, sponsored research, and departmental sales and services sources. A large percentage of this total pays for faculty and staff salaries, while the rest is dedicated to materials and supplies, travel, and equipment.

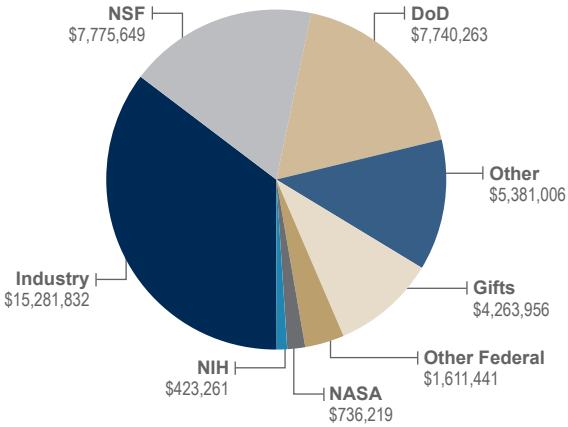
Research funding for FY13 totaled $43,213,627 from grants and contracts, which also includes support received through the Georgia Tech Foundation. Of that total, 35% came from industry, 42% came from federal government sources, 10% came from Georgia Tech Foundation gifts, and 13% came from other sources.

FY13 Expenditures



** Includes Georgia Tech Foundation and agency funds.*

FY13 Research Funding



FY13 Donors

ECE also relies on the generosity of corporate partners, non-profit organizations, and individual donors. We are grateful for their ongoing and enthusiastic support, as evidenced by a grand total of $11,142,944 that was raised in the last fiscal year on behalf of the School and its affiliates for Campaign Georgia Tech. ECE has the second largest fundraising target–$165 million–of any academic unit on campus. To date, about $130 million has been raised toward that goal.

COMPANIES

Agilent Technologies, Inc.
Alcoa, Inc.
Allied Energy Services, LLC
Alpha Imaging Technology Corporation
American Electric Power Company, Inc.
Applied Materials, Inc.
BIT Systems
Boeing Company
Chevron
CIENA Corporation
Cisco Systems, Inc.
ConocoPhillips Corporation
Corning, Inc.
Deere & Company
ExxonMobil Corporation
Georgia Power Company
Global Communication Semiconductors, LLC
Hewlett-Packard Company
Huawei Technologies Co., Ltd.
I & C Technology
Intel Corporation
Linear Technology Corporation
Lingcast, Inc.
Lockheed Martin
Lockheed Martin Aeronautics Company
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Renaissance Charitable Foundation, Inc.
Scholarship Foundation (TSF)
SRC Education Alliance
Vanguard Charitable Endowment
Wells Fargo Community Support Campaign

PROFESSIONAL, RESEARCH, AND ACADEMIC ORGANIZATIONS

American Society for Nondestructive Testing
ETRI
IEEE Power Engineering Society
King Abdullah University of Science & Technology
King Fahd University of Petroleum & Minerals
Space Solar Power Institute

INDIVIDUALS

C. Dean Alford
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Suzy Briggs
H. Austin Brown
Barbara Brown
Robert J. Butera
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Boyce R. Dooley
R. Thomas Dyal
Bonnie H. Ferri
Mildred E. Fielder *(posthumous)*
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Arlen J. Kirchoff, Jr.
John D. Lanza
John C. Lentini, II
Rahmaan Lodhia
Elizabeth B. Logan
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Kristin Ann Turgeon
Judith Vanderboom
Patrick W. Wathen
Sabine E. Wathen
Anita Wathen-Brownlee
Roger P. Webb
Douglas B. Williams

DEVELOPMENT

The ECE Development Office cultivates and coordinates the School's fundraising efforts with industry, alumni, and other interested individuals and organizations. They manage the School's Corporate Affiliates Partnership Program, and they plan the twice-yearly ECE Advisory Board meetings, the James R. Carreker Distinguished Lecture, and the ECE Career Fair. For more information, contact Martina Emmerson Hubbarth, director of ECE Alumni Development, at 404.894.0274; Etta Pittman, director of ECE Corporate Development, at 404.894.6888; or Anna Walker, development assistant, at 404.894.2273.

ECE Philanthropy at Work

FISH BOWL RENOVATION

On January 22, the ECE community celebrated the renovation of the Fish Bowl, located in the Van Leer Building, Room W100. This effort was a true partnership of students, staff, alumni, and school leadership working together to make this new study and tutoring space into a reality, complete with new furniture, cubicles, whiteboards, and writable walls that allow for more student interaction and space for working on team projects. This effort was funded by the Steve W. Chaddick School Chair. Mr. Chaddick (BEE '74, MSEE '82) is pictured with Ryan Palmer, chair of the Georgia Tech IEEE, who initiated the effort with fellow IEEE officer Layla Marshall.

LABORATORY DEDICATED IN AGILENT'S HONOR

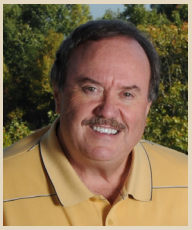
Georgia Tech officials joined Agilent CEO William P. Sullivan *(second from right)* at the Agilent Technologies Laboratory Dedication last fall. Pictured left to right are Stephen E. Ralph, director of the Georgia Electronic Design Center and ECE professor; Gary S. May, dean of the College of Engineering; and G.P. "Bud" Peterson, president of Georgia Tech. Agilent's latest in-kind donation is valued at approximately $90 million (book value) over three years and will comprise Agilent EDA software, support, and training. The software will also be used in undergraduate and graduate courses, including those in the RF/microwave area, in addition to research projects.

ECE Graduates Honored at 2013 College of Engineering Alumni Awards

Four ECE alumni were honored in three different categories of accolades at the 2013 Georgia Tech College of Engineering Alumni Awards. The event was held on April 20 at the Ritz-Carlton in Atlanta.

COUNCIL OF OUTSTANDING YOUNG ENGINEERING ALUMNI

Sanjay Parekh
BSEE '96
Entrepreneur
Duluth, Georgia



ACADEMY OF DISTINGUISHED ENGINEERING ALUMNI

Kenneth R. Entrekin
BSEE '73
Co-Founder and CEO,
Advantage Industrial Automation
Duluth, Georgia

ENGINEERING HALL OF FAME

Howard A. Thrailkill
BSEE '61
President and COO (Retired),
Adtran, Inc.
Huntsville, Alabama

ENGINEERING HALL OF FAME

Kyle Turner
BSEE '68, MSNE '69, PhD NE '71
CEO, McCallum-Turner, Inc.
Denver, Colorado

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Acknowledgements

The 2012-2013 annual report of the School of Electrical and Computer Engineering is produced by Jackie Nemeth and Ashlee Gardner, of the ECE Communications Office, and Sarah Collins, College of Engineering Communications Office.

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Georgia Tech School of Electrical and Computer Engineering