The Ohio State University | Department of Electrical and Computer Engineering

BITS & SPARKS

ALUMNI MAGAZINE | FALL 2016

K-12 OUTREACH CAMPAIGN

Getting kids excited about STEM

EE/ECE Alumni Society

Note from the President - Liza Toher-Reed

EE/ECE Alumni Society

We're looking forward to another great year connecting our alumni with The Ohio State University Department of Electrical and Computer Engineering (ECE), each other, and our incredible students. We will soon launch a new website, where alumni can quickly and easily get information on the announcements and events of both EE/ECE and the Ohio State Alumni Association. As we begin to plan a year with more opportunities to engage you, I hope you plan to engage with us as well. A few ways to do that:

Starting this year, look to your inboxes for a quarterly newsletter, developed jointly between the society and the department, including information on research breakthroughs, scholarship recipients, alumni in the news, and much more. If you have a story to contribute or a new email address to update, please let us know. One of the society goals this year is to increase the number and diversity of events outside the Central Ohio area. We are seeking ECE Ambassadors in other cities to help us host a networking or speaker series, with the goal of bringing in more of our department's leaders, thinkers, and accomplished alumni. If you are interested in helping to plan an event in your area, please get in touch.

The Ohio State ECE Meetup series is going into its third year, and organizers are always looking for new locations, topics, and alumni to get involved. This includes holding more regional events, following a successful networking MeetUp in Dayton this Spring. Check out the group: www.meetup.com/OSUECE-Alumni **and contact program lead** Mark Morscher **with any questions or ideas:** markmorscher@gmail.com

Professor **Bradley Clymer** hosts two alumni panel events annually for students that provide perspective from alumni. These events can accommodate alumni via Skype or other video platforms, and in person. The Next Step program event, typically in September, discusses graduate school (MS and PhD), professional school, and direct to work options with seniors. ECE Night, in January or February, discusses the various EE/ECE programs with first-year students. Contact Prof. Clymer to join a panel at: clymer.1@osu.edu.

The College of Engineering's Annual Homecoming Tailgate is Saturday, October 1, prior to the noon game versus Rutgers Scarlet Knights. The society has a limited number of tickets available for purchase to the football game. You should have received information about how to purchase tickets earlier this month. Please contact Carol Duhigg at duhigg.2@osu.edu if you have questions. We hope to see you at the tailgate.

The Society is always seeking new names and faces to serve on our committees and Board of Directors. Please contact me or Prof. Clymer if you are interested in learning more about these opportunities.

As a reminder, every EE and ECE degree holder from Ohio State is automatically a member of our society. A small activity fee is required to be eligible to purchase society tickets to the Homecoming game (these are different from your alumni tickets through football lottery). As we grow our events, we will bring even more value to this activity fee.

STAY CONNECTED We want to provide you with news, opportunities and events that are of interest. Please take a few minutes to complete our short questionnaire. We've extended our end date to Friday Nov. 11, so please visit**: http://go.osu.edu/16-EE-survey** for a chance to win a $50 Amazon gift card!

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Bits & Sparks
FALL 2016

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PICTURED: A SNAPSHOT FROM THE ECE MEET-UP AT THE CENTER FOR AUTOMOTIVE RESEARCH, FEATURED ON PG. 9

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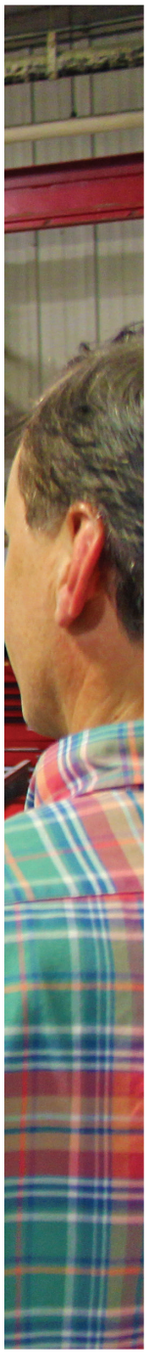

EE/ECE
Alumni Society

ALUMNI

MeetUp.com | **OSUECE-Alumni**

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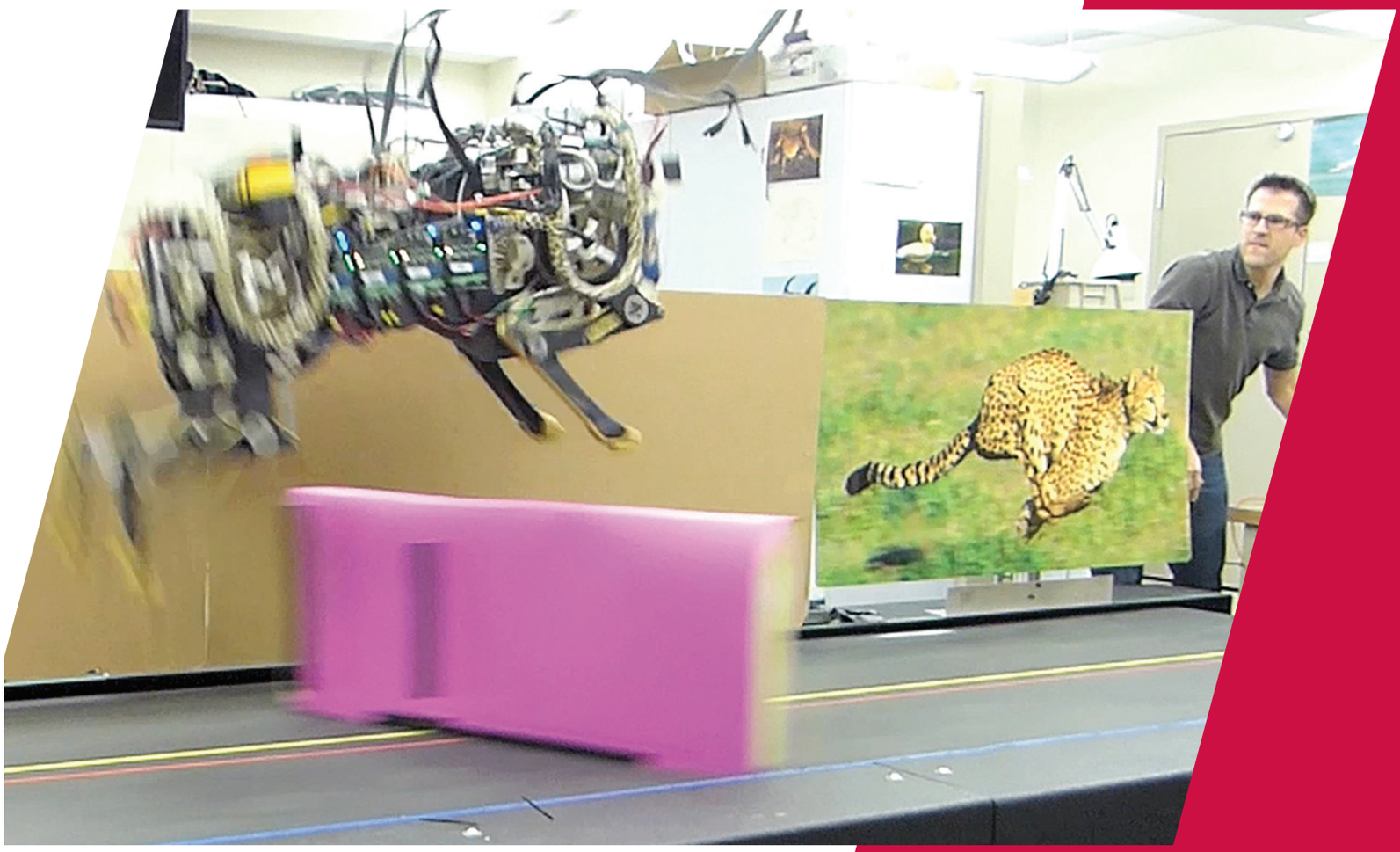
ANIMATING THE INANIMATE



ECE Alumnus **Patrick Wensing** and the Robotics of the Future

"Ohio State provided an incredibly supportive environment for me to grow."

— ECE 2014 graduate Patrick Wensing

One day, advanced robots and humanoids may step in for people, navigating dangerous and life-threatening situations to help save countless lives.

Ohio State alumnus **Patrick Wensing** has found himself at the forefront of this research. After graduating from the electrical and computer engineering PhD program in 2014, he went on to apply this education as a postdoctoral researcher at the Massachusetts Institute of Technology (MIT) Biomimetic Robotics Lab.

Wensing is now using the control system design methods he learned while studying humanoid robotics under Ohio State professor **David Orin**, and is applying them to realms such as robotic perception, sensing and mechanical design.

"I have been working with the MIT Cheetah 2, a 70-pound quadruped robot, in the Biomimetic Robotics Lab," Wensing said. "The robot is one of a kind, with custom-built DC electric actuators that have enabled me to transfer some of the control design principles from my PhD to this unique machine."

By applying some of Wensing's model-predictive control designs, the MIT Cheetah robot is now capable of jumping over obstacles.

In one MIT video, Wensing throws a pink block in the way of the robot as it runs on a treadmill. The machine hurdles it easily. He jots down a note on a clipboard. The smile on his face says it all.

"It's been a rewarding experience, and has led to some exciting new results," he said. "Longer term, I'd like to see these legged robots replace humans in dangerous situations, such as in fire rescue or disaster response. With a growing set of systems science applied to these machines, there's an exciting opportunity to have a positive impact toward achieving these goals in the coming years."

Looking back, Wensing said, his years at Ohio State ECE were formative.

"Ohio State provided an incredibly supportive environment for me to grow, both personally and as an independent researcher," he said.

The undergraduate curriculum provided a foundation of strong technical skills, he said, while Orin gave him the drive to continue his efforts through graduate school.

From the Ohio State Marching band, to the FIRST Robotics program and other club sports, Wensing said Ohio State gave options outside of the classroom as well.

"Graduate school in the department provided the freedom to immerse myself in robotics and shape my own views on the field. I am grateful to have had support from many faculty members along the way to develop and pursue my personal goals," he said. "This support helped me find a great deal of enjoyment in robotics research and showed me the potential for a fulfilling career in academia."

Orin said Wensing wasn't just a typical student. He was the top undergraduate at Ohio State in June 2009 when he received his BS degree. He had a perfect 4.0 GPA, which he carried through graduate school as well.

What is it about robotics that continues to fascinate Wensing more than the other scientific disciplines? Curiosity. Being able to use robotics as an excuse to explore other technical realms.

"Being a roboticist means I get to come into work and pursue problems across control, computer science and mechanical design," he said. "And I get to tackle these problems as a hands-on engineer, with machines that come to life."

Animating the inanimate, he said, captured his mind from the start.

"Robots in motion have an intrinsic allure, and I think this draw has been used to great effect in attracting and retaining students in engineering," Wensing said. "I was one of those students, and I suppose I have been having too much fun to change focus since." ■

Recharging Support

ECE alumnus **Mark Morscher** had a full circle moment in 2013 when he returned to Ohio State on a College of Engineering curriculum tour with his son, a prospective student.

"It was my first time being inside the facilities and observing the research and offerings to current students in quite awhile," he said. "I was just really blown away and impressed."

Despite it being over two decades since graduating, Morscher jumped back into his ECE roots with both feet. He now volunteers by reaching out to other alumni, encouraging involvement, and educating them on new research and events available to current students.

Always the engineer, he also helps the department compile and analyze alumni data for the most effective communication strategies.

Morscher said he wants to see more ECE graduates come back to Ohio State and be similarly impressed.

To help this happen, he launched the popular ECE MeetUp social/tech series. On a quarterly basis, Morscher and the department hold events for alumni located at places like the ElectroScience Lab, the High Voltage Lab, the Center for Automotive Research, Nikola Labs or Nanotech West. Modern research is explained, tours are held with faculty, and generally people just enjoy catching up and networking over snacks.

Morscher has even helped bridge the gap between the past and present by encouraging alumni to help judge student research poster competitions, or show support for those participating in the OHI/O Hackathon Showcase, Makeathon and K-12 Engineering Outreach events.

In May, Morscher traveled to Dayton with ECE Chair **Joel Johnson** and others to hold a MeetUp event on the road – something he hopes to do in areas like Cincinnati and Cleveland as well.

"I was just really shocked at how much has changed in the 25 years since I graduated, and very proud of what the ECE department has become," Morscher said.

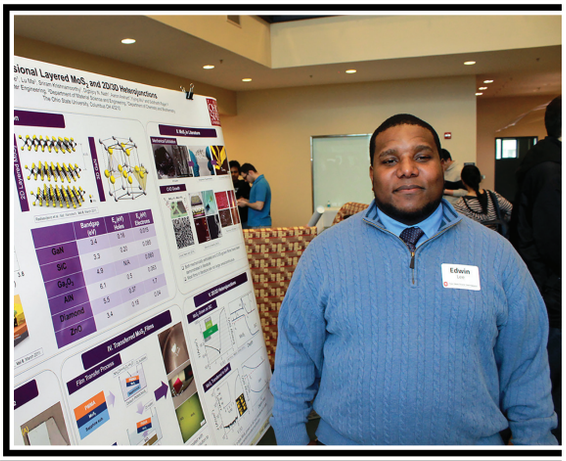
What motivates him to keep strengthening those ties? The changes and advancements he sees at ECE.

"I figure if I was so amazed and impressed with what I saw, then there must be more alumni like me out there as well, who just need to experience it," he said. "I've been working with the department to find different ways we can try to reach out to alumni and get them exposed with a little more of a hands-on experience with what is happening in 2016 within the department." ■

> **"I was just really shocked at how much has changed in the 25 years since I graduated, and very proud of what the ECE department has become."**

@OhioStateECE MeetUp

Watch Online:
go.osu.edu/meetup-video



Equal parts socializing, networking and research discovery, the Ohio State Department of Electrical and Computer Engineering created the ongoing MeetUp alumni event series to help keep past graduates connected to the present. Stay informed about groundbreaking research students and faculty are exploring today. To date, the series has led alumni on a personal tour of Ohio State's EcoCAR program at the Center for Automotive Research, and opened the doors to the ElectroScience Lab during the annual John D. and Alice Nelson Kraus Memorial Student Poster Competition. Join us for new events scheduled throughout the year. Each Meetup starts with a presentation on current research projects, followed by a personal tour of the facility or program, ending with socializing and networking over snacks. Upcoming events will explore the Department's Robotics Lab, mobile health research and more. ■

Learn more by joining the **ECE MeetUp** page: **go.osu.edu/Meetup**

ECE Department

Note from the Chair – Joel Johnson

The 2015-2016 academic year was another dynamic chapter in the story of the Ohio State Department of Electrical and Computer Engineering. The undergraduate student population has steadily grown from just 660 in Autumn 2008 to 916 as of Autumn 2015, and the graduate student roster has similarly advanced from just over 300 to 525 in that same time period.

The department's personnel include 48 tenure-track faculty, 12 research faculty, and 4 clinical faculty, of whom 21 are Fellows of the IEEE. Our ECE worldwide alumni population now tops 11,000.

The department was proud to welcome multiple new faculty members in the past year. Professors **Ayman Fayed** (analog circuits) and **Abhishek Gupta** (control theory) joined in Autumn 2015, and Prof. **Jian Tan** (cloud computing) in January 2016. Profs. **Graeme Smith** (radar systems), **Nima Ghalichenchian** (MEMS technologies), and **Niru Nahar** (THz/electromagnetics) also joined as Research Professors.

One of our key strategic initiatives is to increase the department's faculty size by participating in multiple college and university initiatives. In concert with this goal, the department actively contributed to multiple Ohio State Discovery Themes (http://discovery.osu.edu) to support a number of recruitments in the past year. Prof. Tan, in fact, was the first ECE faculty member recruited as part of Ohio State's Data Analytics Discovery Theme. I am pleased to inform you that multiple faculty will be joining the department in 2016-17, including Profs. **Sanjay Krishna** (solid state electronics), **Asimina Kiourti** (electromagnetics, textile antennas), **Vanessa Chen** (A/D converter design and analog circuits), and **Khaled Salama** (circuits/system-on-chip). We are very excited to have these outstanding educators and researchers join our team.

Join us in this latest issue of Bits & Sparks as we explore the groundbreaking new research and professional achievements of our past graduates, as well as student profiles of exceptional undergraduate and graduates prepared to make great future contributions. We'll discover an alumnus who used ECE as a springboard to further his work in advanced robotics, alumni making news in the corporate world, engineering outreach programs finding our next generation of ECE leaders, and our research efforts hitting the national media – from The Not Face, to futuristic fashion, to our new role in the #SmartCityColumbus federal program. Even at twice the size of last year's magazine, this issue still reflects only a small portion of the outstanding efforts put forth daily by our dedicated faculty, researchers, students and staff.

We encourage you to join our quarterly ECE MeetUp social/tech events, either in person or online, as we continue to expand ECE events outside of Columbus. We hope you will enjoy catching up on our journey through 2015-2016, and look forward to your involvement in the coming year. Support from our alumni is crucial to the department's progress and advancement, as well as to our current students; our team would be happy to talk with you if you are interested in playing a role. As always, we thank you for your continued support. ■

ECE Alumni Voices: Gene Sapp

Retired ECE alumnus **Gene Sapp** *served at the department from 1958-1999. He also won the annual H.C. Ko Meritorius Service Award in 2009. After reading the Sept. 14, 2015 issue of* **ECE Weekly**, *he learned about fellow alumnus* **George Baughman** *featured in an article about autonomous trains. Sapp then sent a nice note about his memories of Baughman...*

"Among other administrative duties (as a staff member in the department), I was involved in nominating alumni and faculty members for recognition at Ohio State. I was a little surprised (and pleased) to see the name of George Baughman in your recent email. Some years back, probably in the 1980s, we successfully nominated him for an honorary doctorate from Ohio State. I was responsible for gathering information (re: his accomplishments) and writing the nomination. Mr. Baughman had a remarkable career. During WWII, the railroads were responsible for the movement of armed forces personnel, weapons, materials for production of weapons, etc. in very large quantities. Mr. Baughman was widely recognized for his work to make railroad signaling and switching more efficient. This work earned him a personal citation from President Truman. During this process, Baughman visited the campus at least twice. Prof. Ko and I liked him very much. My memory is not as good as it once was, but I am pretty sure Baughman grew up on a farm near Findlay. One thing I do remember clearly, is him telling us he has always been grateful to Ohio State for taking a raw farm boy and making him an engineer." ■

Find more issues of ECE Weekly online at: ece.osu.edu/ece-weekly-newsletter

Corporate Caring Award: Alumnus **Michael Swartz**

ECE alumnus (1984) and ECE Industrial Advisory Board member, **Michael Swartz**, was featured in an article by Columbus *Business First* this year for his ongoing dedication to community outreach.

The 2015 Corporate Caring Awards honor for-profit companies for their donations and commitment to supporting local charitable organizations and causes.

Business First focused on Swartz, as CEO of Lake Shore Cryotronics, who "regularly brings young people to learn about the company and the work that its employees do."

Creating probes, sensors and other equipment used during scientific experiments, Swartz helps pay it forward by organizing Student Day, allowing employees to give presentations about their work to groups of high school students. Swartz also holds Shadow Day for engineering students at Ohio State.

Swartz said interactions with Lake Shore Cryotronics help give students a wider scope of science-related careers to choose from after graduation.

"People like the opportunity to make these presentations," he told the magazine. "They like the opportunity to talk to students and young people. Our employees like the opportunity to give back." ■

Alumna Joins Prestigious NAE

Considered a career-defining achievement, ECE alumna **Dr. Yilu Liu** earned membership into the distinguished National Academy of Engineering (NAE) this year.

The NAE reported Liu was elected based on her "innovations in electric power grid monitoring, situational awareness and dynamic modeling."

Liu earned her MS and PhD in electrical engineering from Ohio State in 1986 and 1989, respectively. Today, she is at the University of Tennessee at Knoxville where she is Governor's Chair Professor in Electric Power/Energy Systems Engineering.

Election to the NAE is considered among the highest professional distinctions accorded to an engineer. Academy membership honors those who have made "outstanding contributions to engineering research, practice, or education, including, where appropriate, significant contributions to the engineering literature" and to "the pioneering of new and developing fields of technology, making major advancements in traditional fields of engineering, or developing/implementing innovative approaches to engineering education."

Ohio State electrical engineering professor emeritus, **Stephen Sebo**, said he remembers Liu well from his time spent serving as her mentor.

"She was an excellent student, and had a stellar career later," he said. "I consider Yilu Liu as one of the two best students I advised at Ohio State."

In total, NAE elected 80 new members and 22 foreign members for its 2016 roster. This brings the total U.S. membership to 2,275 and the number of foreign members to 232. Individuals in the newly elected class are formally inducted during a ceremony at the NAE's Annual Meeting in Washington, D.C. on October 9, 2016. ■

The Ohio State Department of Electrical and Computer Engineering has several alumni and emeritus faculty who share the high distinction of NAE professional engineering membership status. Those members include:

Dr. Eric D. Evans electrical engineering

Dr. Robert S. Chau electrical engineering

Dr. Burn-Jeng Lin electrical engineering

Dr. Yilu Liu electrical engineering

Dr. Jose Cruz, Jr. electrical engineering

Dr. Marvin White electrical engineering

Dr. Robert Fenton electrical engineering

Cline-Armstrong

Dominguez

ALUMNAE WIN HARRIS "TEN UNDER TEN" AWARD

Two ECE alumnae continue to collect accolades in their post-collegiate life.

As employees of the Harris Corporation, ECE graduates **Julia Cline-Armstrong** ('14) and **Kate (Scherer) Dominguez** ('12) won the company's inaugural "Ten Under Ten" industry award.

The award honors emerging engineers for ongoing success and demonstrated leadership in their communities and profession, within 10 years of obtaining an undergraduate degree. Nominees were submitted by their managers and peers.

Dominguez, who joined Harris in 2012, designed an audio/video solution for a key international customer of Harris Corporation. She also established an Early Career Women's Book Club, focusing on self-development. Armstrong, who joined Harris in 2014, helped design a new Field Programmable Gate Array (FPGA) feature for the company's next generation waveform. She also serves as the Director of Community Outreach for the Project Management Institute (PMI) Rochester Chapter.

As undergraduates at Ohio State, the two were first paired together in the Women in Engineering Connect Mentoring program. The two maintain ties to their alma mater by serving as Ohio State brand managers at Harris (a longtime ECE program supporter) and leading recruiting efforts, as well as engaging current students.

Dominguez is also part of an ECE program family legacy: all five Scherer siblings attended Ohio State, four of which earning their electrical engineering degrees. In honor of her father, Dominguez and her husband, Miguel, established the Bob Scherer Memorial Scholarship through the Ohio State Women in Engineering group. The scholarship is for any highly-motivated and positive female student intending to attend or currently enrolled at Ohio State in Electrical and/or Computer Engineering.

Armstrong made her mark at Ohio State as a member of the inaugural Buckeye Current program, which began as the Buckeye Electric Motorcycle Race Team. Over four years, she helped shape the program into an international design and race cooperative, later becoming Project Manager and leading the team to two third-place wins at the Isle of Man TT Zero race. Today, she serves as Alumni Chair.

Harris Corporation is a leading technology innovator, supporting customers in more than 125 countries, with approximately $8 billion in annual revenue and 22,000 employees worldwide. ■

Learn more at: harris.com

2016 IN MEMORY

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1
REMEMBERING MUELLER

One of NASA's brightest administrators, George Mueller, died Oct. 12, 2015 at the age of 97.

In 1951, Mueller earned his PhD in physics from The Ohio State University. While working toward his degree, he served as an assistant professor of electrical engineering. His university research focused on the new field of system engineering, as well as dielectric antennas.

Mueller went on to become regarded as the "father of the space shuttle" and helped design Skylab (America's first space station). As head of NASA's Office of Manned Spaceflight, Mueller is generally credited as the person who made landing on the Moon possible in 1969 by meeting President John F. Kennedy's short timeline challenge through bold management skills.

2
CARLTON H. "BUCK" WALTER

The respected former ElectroScience Lab director died March 8, 2016. Walter started working at ESL in 1948 while he was a graduate student, and served as its Director between 1977 and 1983.

3
HSIUNG HSU

Prof. Hsu joined the Ohio State Electrical Engineering Department in 1962, and retired in 1990. He was 96 when he died on Saturday, April 30.

4
CARL RUSSELL

A 32-year employee of Ohio State, and longtime ECE technician at Caldwell Labs, Russell died April 13 at the age of 80.

5
ART ERDMAN

Former longtime ECE Assistant Professor, Erdman died Feb. 29 at the age of 89.

PICTURED: TESLA COIL DEMO FROM INSIDE THE HIGH VOLTAGE AND POWER ELECTRONICS LAB

"While researching American Sign Language, Martinez ended up touching upon a whole new realm of data regarding how facial expression relates to human language."

FROM *THE NOT FACE* ON PAGE 16

RESEARCH

THE NOT FACE

New Research Speaks to the **Evolution of Language**

It's a look that tells somebody you are not happy, sometimes referred to as "casting shade."

And for the first time, research from Ohio State ECE reveals how that look of negative judgement is a universally-shared act committed across international cultural boundaries.

Media outlets across the world had some fun with the latest research work from ECE professor **Aleix Martinez** in the Computational Biology and Cognitive Science Lab. He co-authored the research published this year in the *Cognition Journal*. Over 80 news outlets created their own stories, with some effective uses of memes, and even posting their own "not face" selfies. Even Grumpy Cat can't escape the label (Google it).

Martinez specializes in computer engineering and how it relates to cognitive science. While researching American Sign Language, he ended

"While researching American Sign Language, (Martinez) ended up touching upon a whole new realm of data regarding how facial expression relates to human language."

up touching upon a whole new realm of data regarding how facial expression relates to human language.

In his latest work, Martinez explores the hypothesis that humans began expressing negative moral judgment as simple facial expressions.

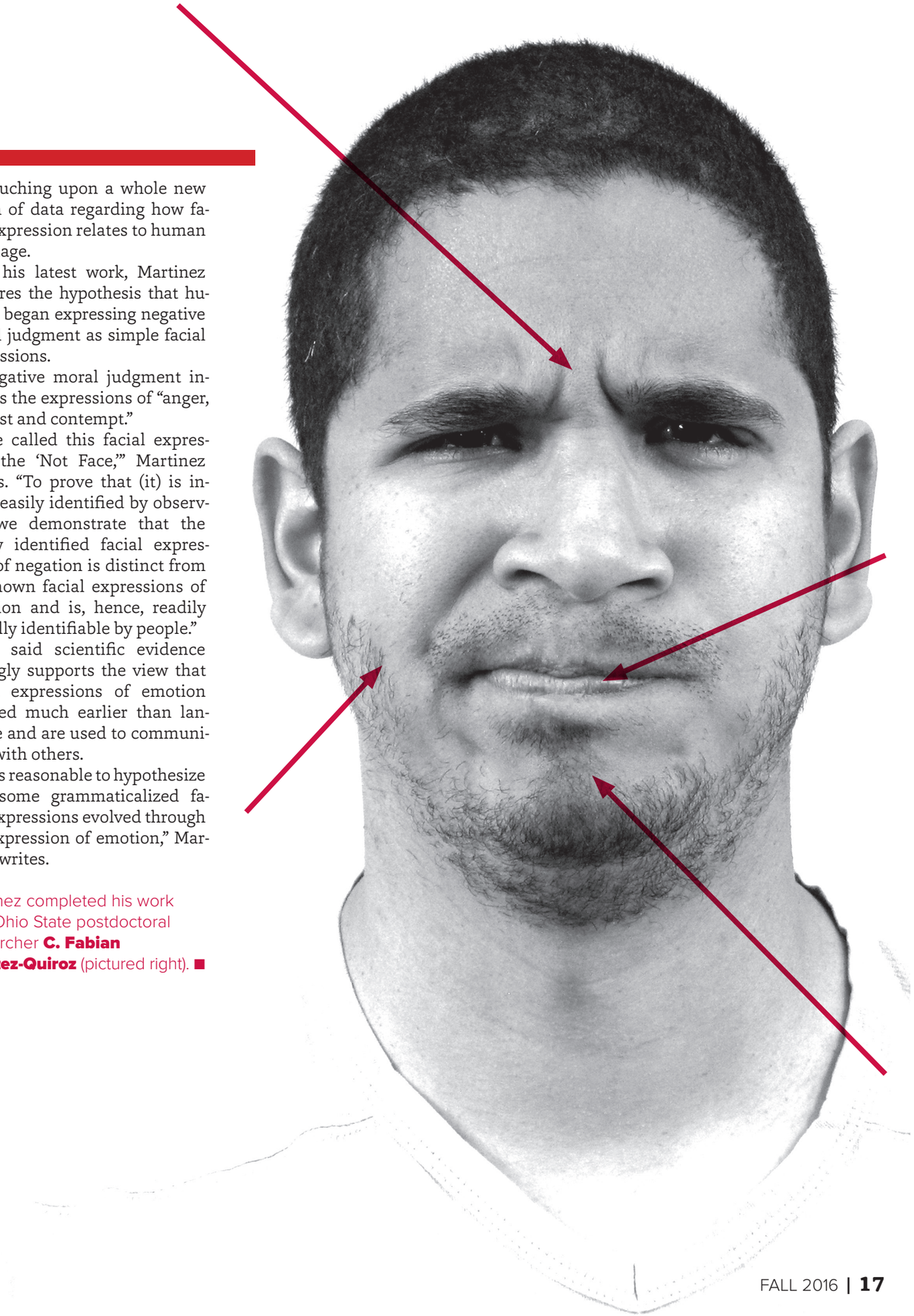
Negative moral judgment includes the expressions of "anger, disgust and contempt."

"We called this facial expression the 'Not Face,'" Martinez writes. "To prove that (it) is indeed easily identified by observers, we demonstrate that the newly identified facial expression of negation is distinct from all known facial expressions of emotion and is, hence, readily visually identifiable by people."

He said scientific evidence strongly supports the view that facial expressions of emotion evolved much earlier than language and are used to communicate with others.

"It is reasonable to hypothesize that some grammaticalized facial expressions evolved through the expression of emotion," Martinez writes.

Martinez completed his work with Ohio State postdoctoral researcher **C. Fabian Benitez-Quiroz** (pictured right). ■



FUTURISTIC FASHION

NEXT-GENERATION WEARABLE TECHNOLOGY COMING SOON

Researchers at Ohio State ECE took the tech news world by storm this year after reaching a milestone in the development of wearable electronics. They can now embroider circuits into fabric with 0.1 mm precision—the perfect size to integrate electronic components, such as sensors and computer memory devices, into clothing.

Media writers had fun with the concept:
"Internet of Pants?"
"Science and Technology and Arts and Crafts"
"Smart Pants?"

With this advancement in precision, Ohio State takes the next step toward the design of functional textiles—clothes that gather, store, or transmit digital information. With further development, the technology could lead to shirts that act as antennas for smart phones or tablets, workout clothes that monitor fitness levels, sports equipment that tracks an athletes' performance, a bandage that tells a doctor how well the tissue beneath it is healing, or even a flexible fabric cap that senses activity in the brain.

"A revolution is happening in the textile industry," said **John Volakis**, the Roy & Lois Chope Chair Professor of Electrical Engineering at Ohio State. "We believe functional textiles are an enabling technology for communications and sensing—and one day even medical applications like imaging and health monitoring."

Working primarily out of the ElectroScience Laboratory on Kinnear Road, Volakis and his team developed a prototype Ohio State logo patch equipped with a wearable antenna.

Inside the lab, Senior Research Associate Engineer **Asimina Kiourti** demonstrated how the fabric is woven into one side of the logo, while the color fabric is visible on the other side using a simple sewing machine.

"I think the applications are abound," Volakis said. "A project we have is the ability to track fluids in the lungs to prevent heart attacks. If you have a tumor that you want to track, that can be done as well."

Kiourti said she has dedicated her work toward exploring the relationship between electromagnetics and antennas, finding real-life applications.

"Particularly applications related to the body, no matter inside or outside the body," she said. "Textile antennas are the best way to achieve flexibility and have unobtrusive garments - smart garments, with more functionality."

With new patents pending, they recently published the lab results in the journal *IEEE Antennas and Wireless Propagation Letters*.

Wearable technology can also be fun, Volakis said, by incorporating new uses into sports and school logos for students to power their lives, or even share information with one another.

"You will have all the information available... maybe more than you would like to share," Volakis joked. "There are just so many things to be done, but it will take time. We think it's going to happen." ■

Watch a video of **John Volakis** and **Asimina Kiourti** discussing wearable tech and its potential:
go.osu.edu/etextiles

1 Research Assistant Professor Arda Kurt demonstrates the autonomous vehicle test program.
2 The first fully-autonomous vehicle, designed by ECE Professor Emeritus Robert Fenton.
3 Representing decades of autonomous vehicle research, Fenton vists with Prof. Umit Ozguner.

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#SmartCityColumbus

Intelligent transportation systems

This summer the U.S. Department of Transportation officially declared Columbus, Ohio the winner of its $140 million Smart City program. Columbus now stands to become a beacon for what cities might achieve in the future as they learn to accommodate steadily growing – and driving – populations.

Aside from the influx of federal funding, Vulcan Inc. also plans to develop the city into a test track for intelligent transportation systems.

All of this positions Ohio State to play a central role as the collaborative team moves forward. University researchers and faculty in the Department of Electrical and Computer Engineering (ECE) said they are excited by the implications and expectations of what comes next.

"We should be proud of this," Ohio State Center for Automotive Research (CAR) director **Giorgio Rizzoni** said. "CAR activities related to automated and electrified vehicle technologies are one of the many reasons Columbus won."

Ohio State ECE researchers pioneered the field of autonomous and intelligent transportation systems, dating back to the 1960s. The world's largest technical professional organization, IEEE, once highlighted Ohio State's role in autonomous vehicle research with the article, "The Drivers Behind Autonomous Vehicles."

Before Google, General Motors, Nissan or others gave much thought to driverless technology, there was Ohio State electrical engineering professor **Robert Fenton.**

"No researcher before Fenton had pursued automated vehicle technology. In 1962 his team at the university built the first automated vehicle, which is also believed to be the first land vehicle to have a computer. Steering, braking, and speed were controlled via onboard electronics, which filled the trunk, back seat, and most of the front passenger side of the car," the IEEE article states.

Fenton's work later continued through the efforts of fellow Ohio State ECE professor emeritus **Umit Ozguner**, who last year won a $230,000 National Science Foundation (NSF) Smart City grant to fund his work with fellow Ohio State professor **Bilin Aksun Guvenc,** who developed the project, as well as assitant professor-clinical **Keith Redmill**. Their research deals in traffic sensing and accident avoidance for automated shuttles. The team is now looking to integrate advances in software, sensing and control, and modeling to address weaknesses in autonomous vehicle designs. A key issue in their work is the human component, including understanding how people make decisions and how to predict their actions.

Ohio State professor **Levent Guvenc,** who shares department roles in ECE, as well as Mechanical and Aerospace Engineering, is the director of Ohio State's new Automated Driving Lab, which is taking the science behind intelligent transportation into new realms.

"This project will transform Columbus into an exemplary smart city," Guvenc said. "This is a very exciting time for residents of the City of Columbus and also Ohio State, which is the main academic partner of this proposal. So, it is not just the city, Ohio State has also won."

Guvenc said the Smart City Challenge proposal for Columbus includes several aspects on the use of autonomous shuttles in the Easton Town Center and the Ohio State campus, such as the convoying of trucks, adding buses that communicate with traffic lights for rapid transit along Cleveland Avenue, as well as a shuttle service for the Linden area. The proposal also outlines the need for electric vehicles.

"We expect the city and its surroundings to be a live testbed for green – all electric – autonomous shuttles, which will attract all major Original Equipment Manufacturers, smaller on-demand ride-sharing companies and suppliers to come to Ohio State for research and to test their connected and automated driving vehicles in the roads of Columbus," Guvenc said.

The award was a coup for Columbus, with a win that comes after beating out 78 initial competitors and seven top finalists – including San Francisco, Austin, Portland, Kansas City, Denver and Pittsburgh.

> "THIS PROJECT WILL TRANSFORM COLUMBUS INTO AN EXEMPLARY SMART CITY."

Ozguner also commented on the recent Smart City win and its implications for Ohio State research moving forward.

"It is not clear how much fresh research implications this has directly and immediately, as the city would like to have systems already on the market. However, being labeled the city with cutting edge technology in transportation would and does affect the mindset of possible sponsors developing new transportation and new intelligent vehicle technologies," he said. "There will be a positive symbiotic effect. And of course, we can rightfully claim that a lot of Intelligent Vehicle and self-driving car research started here in ECE, not to mention the first NSF funded Smart City project in Columbus."

This summer, Levent Guvenc and Bilin Aksun Guvenc joined representatives from the City of Columbus to present the research behind the Smart Shuttle NIST GCTC technical cluster in Austin, Texas.

"The idea of Smart Shuttle is to build a unified, replicable and scalable architecture for connected and automated driving, which can be used by different vendors and replicated in different deployment sites and cities," Guvenc said.

Ohio State Assistant Vice President for Mobility Research and Business Development, **Carla Bailo**, as well as Ohio State's Co-director of the Honda/Ohio State Partnership, **Joanna Pinkerton**, coordinated involvement among university centers and affiliates, including CAR, the Crash Imminent Safety University Transportation Center, Transportation Research Center, the Center for Urban and Regional Analysis, and ECE. ■

HUSTER LEADS OHIO STATE ECOCAR3 INTO ANOTHER WIN

Written on a whiteboard inside Ohio State's EcoCAR 3 student headquarters, team leader **Andrew Huster** posted his simple to-do list: **"BUILD THE CAR. WIN. EAT ICE CREAM."** It's safe to assume ice cream was enjoyed in sunny California this spring.

On May 27, the U.S. Department of Energy (DOE) and General Motors Co. (GM) officially crowned Ohio State this year's winner of the EcoCAR 3 – Advanced Vehicle Technology Competition during an awards ceremony at the Hotel del Coronado in San Diego.

It was the second stage of an ongoing four-year competition that culminates in 2018. Ohio State took first place in EcoCAR 3 last year, and previously won the final year of EcoCAR 2, making this the third consecutive win for the team.

For those unfamiliar, EcoCAR 3 is the latest DOE competitive series sponsored by General Motors and managed by the Argonne National Laboratory. The program is considered the ultimate training ground for building future automotive leaders. It challenges 16 North American university teams to redesign a Chevrolet Camaro, ultimately reducing its environmental impact and increasing efficiency, while maintaining muscle and performance style. Teams have four years (2014-2018) to harness their ideas into the ultimate energy-efficient, high performance vehicle.

Huster, an electrical and computer engineering graduate student at Ohio State, has worked his way up the EcoCAR ladder over the past five years, from doing grunt work building electronics, to managing its recent win as team leader.

The Ohio State crew decided to convert their Camaro into a performance plug-in hybrid after conducting market research in several regions around Columbus, Ohio. This meant ripping out the 3.6L V6 and replacing it with a 160hp (119kW) 2.0L, four-cylinder engine to run on E85 gasoline, coupled to a 200hp (150kW) electric motor from Parker Hannifin powered by an 18.9kWh battery from A123. The plug-in hybrid Camaro is able to do 45 miles (72km) on battery power alone and should be capable of 65MPGe.

The students designed and built a custom power transfer unit, as well as all the system integration for the car. Additionally, they spent a lot of time reducing its weight and making sure everything added actually fit inside the frame. This meant swapping out the V6 for a smaller engine.

Huster said the team's big innovation is a system called DRIVE (Driver Recommendation for Increased Vehicle Efficiency), which provides drive mode recommendations after taking into account outside impediments like traffic or road conditions.

The turnaround for re-engineering this year's Camaro was a bit daunting compared to previous years, Huster said. Teams began work in February, leaving just three months for disassembling the existing powertrain and integrating their hybrid-electric designs into a wholly unique version of the car.

Moving forward, Huster has one more year left in the ECE program before graduation and moving on to the real world in 2017.

"I'm getting wistful," he said. "It's been fun. There are a lot of really great people on the team."

He said the entire experience has taught him not only how to manage complex projects, but work well as part of a team.

"It's those soft skills that you only acquire by doing," he said.

Finding room for improvement in today's modern automotive engineering world, Huster said, has become the real challenge.

"Electrical engineering is where the innovation is coming from," he said. "Now, it's all in the software."

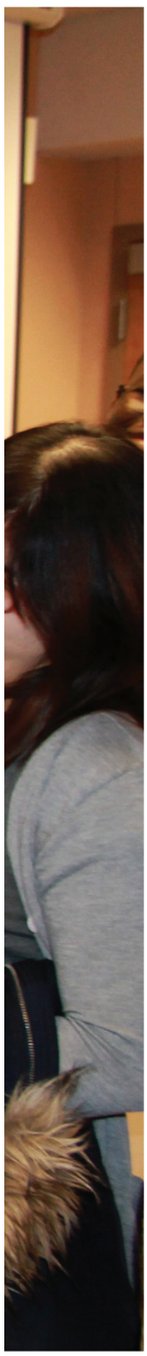
The Center for Automotive Research at Ohio State is also planning to create a new automotive electronics lab to help further prepare students for leadership roles within the industry. ■

PICTURED: 2016 DISTINGUISHED SCHOLAR, JOHN VOLAKIS

WATCH A VIDEO OF VOLAKIS GIVING A SPEECH AFTER RECEIVING THE AWARD: **http://go.osu.edu/volakis-vid**

"It was the dream I had to grow up and be an electrical engineer, because I grew up with no electricity."

PROF. JOHN VOLAKIS ON PAGE 26



AWARDS

2016 DISTINGUISHED SCHOLAR: JOHN VOLAKIS

Dr. John Volakis, Director and Professor at the Ohio State ElectroScience Laboratory, was named among six university-wide 2016 Distinguished Scholar Award winners.

Volakis, an ECE faculty member, was surprised with the award during a routine work meeting on Feb. 12.

"You kept a very good secret," Volakis told the full audience of faculty, staff, friends and family who attended. "I love what I do. It's been my passion, my life."

Growing up on a farm in Chios, Greece as a child, he said, helped define his future career aspirations.

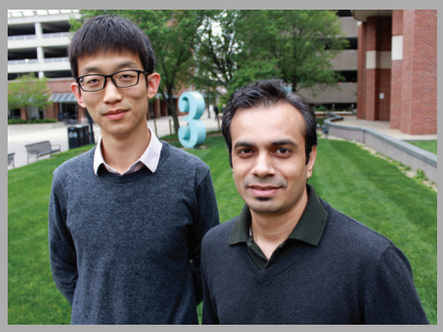
"It was the dream I had to grow up and be an electrical engineer, because I grew up with no electricity," he said. "What an absolute thrill it is to recognize the kind of accomplishments that you have evidenced over your career," Ohio State Executive Vice President Provost **Bruce McPheron** said. **Jan Weisenberger**, senior associate vice president for research, and chair of the award selection committee, admitted the group can be "pretty contentious" about who is picked for the award.

"But they weren't very contentious when it came to John's dossier," she said. "Looking at both your theoretical contributions in hybrid finite element methods, and then the broad range of applications, to antennas and everything radio frequency – hand held devices, medical devices – just the breadth of it, was pretty humbling to the committee. It is with great pleasure that we congratulate you on all your accomplishments."

As a young adult who first came to Ohio State at the age of 18, Volakis said he spoke no English, but the faculty and students he met were always kind.

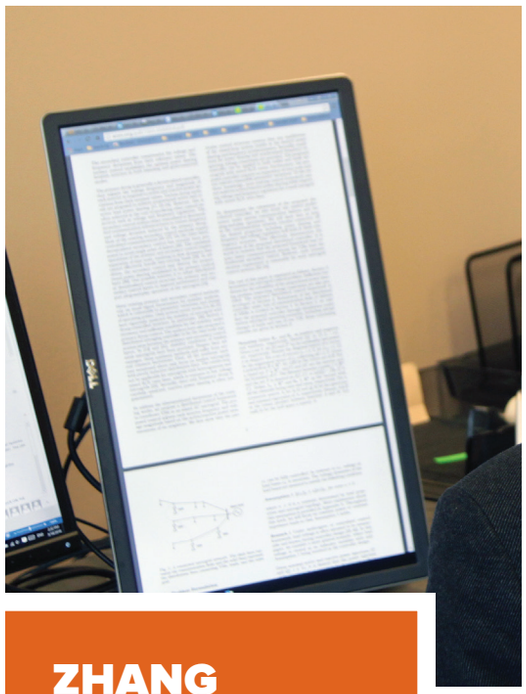
"They helped me with everything that I needed," he said. "I just love this country, from the very moment that I stepped my foot on it. It's been a wonderful experience for me."

The Distinguished Scholar Award, established in 1978, recognizes exceptional scholarly accomplishments by senior professors who have compiled a substantial body of research, as well as the work of younger faculty members who have demonstrated great scholarly potential. Distinguished Scholars receive an honorarium and a research grant to be used over the next three years. The award is supported by the Ohio State Office of Research.



ECE graduate students **Sen Li** and **Shubhendu Bhardwaj**, both won Ohio State Presidential Fellowships from the Graduate Studies Committee. Li is currently pursuing a doctoral degree in Electrical Engineering. His research interests include control and planning of hybrid and stochastic dynamic systems, and their application in various engineering fields, especially electric vehicles, ancillary market and energy systems.

Bhardwaj is a PhD candidate and graduate research associate at the ElectroScience Lab. He is advised by professors John Volakis and Siddharth Rajan. His research areas include electromagnetics and multi-physical modeling, HEMT modeling for terahertz operation, antenna guiding and slow-wave structure designs, as well as plasmon electronics in 2D electron-gas systems.



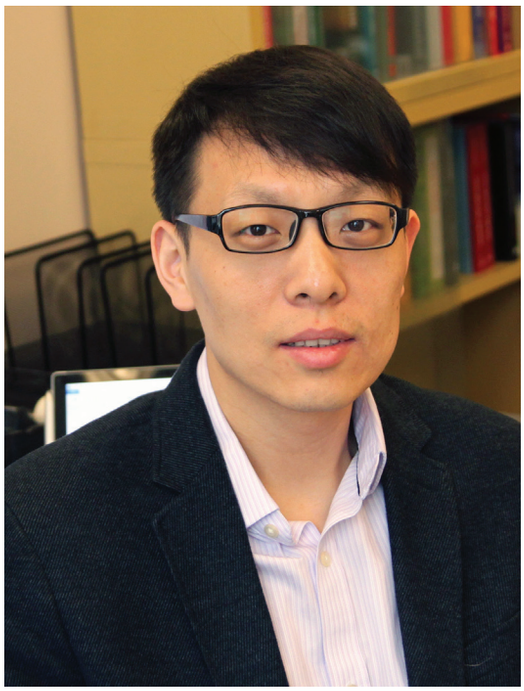
ZHANG WINS PRESTIGIOUS CAREER AWARD

Electrical and Computer Engineering Assistant Professor **Wei Zhang** recently received the prestigious Faculty Early Career Development (CAREER) award from the National Science Foundation (NSF).

The CAREER award is given to support the work of the nation's most promising junior faculty who exemplify the role of teacher-scholars through the integration of outstanding research and excellent education.

Zhang was awarded $500,091 from the NSF Division of Computer and Network Systems for his power grid research project, "Hierarchical Control for Large-Scale Cyber-Physical Systems."

Over the next five years, Zhang will establish new control and game theoretic foundations, along with numerical algorithms, to enable formal and scalable design of hierarchical



control systems for large-scale cyber-physical systems.

Many complex engineering concepts - such as electricity demand response programs, communication networks, ground and air transportation systems, and robotic networks - involve interactions among a large number of agents with coupled dynamics and decisions due to their shared environment and resources. Such systems are often operated using a hierarchical architecture, where a coordinator determines some macroscopic control signal to steer the population to achieve a desired group objective while respecting local preferences and constraints for individual agents.

Zhang's research aims to significantly advance the understanding of complex engineering systems that involve coordination of a large population of dynamic agents. One key application is coordinating the vast amount of distributed energy resources to achieve efficient and reliable operations of the future power grid. In collaboration with researchers at national labs and industries, the project is also expected to yield new design principles and practical algorithms for the modernization of the power grid.

ECE professor **Kevin Passino** joined a prestigious group of worldwide scholars after being named to the Fulbright Specialist Roster this year.

Passino is the Director of the Humanitarian Engineering Center, an Ohio State group dedicated to promoting human welfare, social justice and sustainable development through engineering education in the classroom and project work around the world.

The Fulbright Specialist Program (FSP) links U.S. scholars and professionals with their counterparts at host institutions overseas. The Roster is a list of all candidates eligible for matching with incoming project requests from overseas academic institutions for Fulbright Specialists. Passino was given the honor on behalf of the U.S.

Department of State's Bureau of Educational and Cultural Affairs (ECA) and the Institute of International Education's Council for International Exchange of Scholars (CIES).

HARRISON FACULTY AWARD

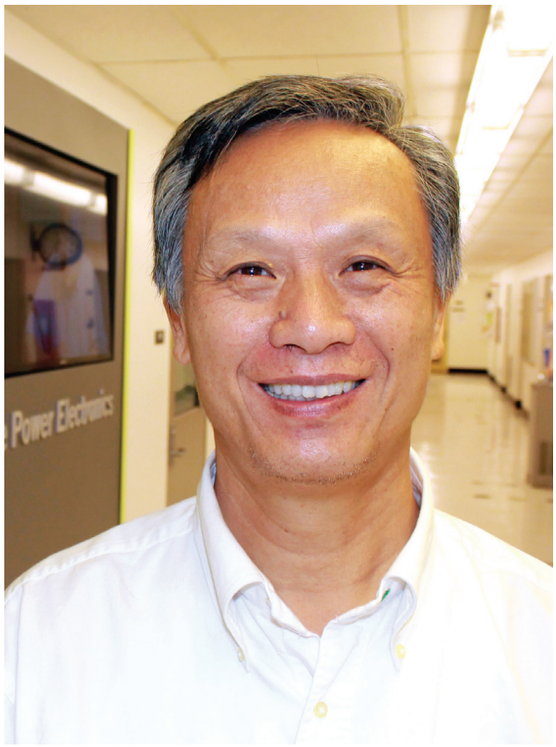
For his ongoing excellence in applied research, ECE Professor **Eylem Ekici** won the 2016 Doris A. and Stanley E. Harrison Faculty Award.

Presented by the Ohio State College of Engineering, the award was established in 1982 to recognize engineering faculty making a positive impact on society through engineering education and research. Ekici is specifically being recognized for his exceptional fundamental or applied research in one or more areas within the college.

Ekici is considered a leading scholar in the area of network algorithm design and how it applies to various application domains, such as wireless sensor networks, cognitive radio networks, and vehicular communication networks. His research approach is deeply rooted in the development of provably optimal algorithm design, with the objective of solving problems that have a practical impact. With this approach, he is considered a leading figure in the greater networking community that bridges theoretical networking and implementation-oriented systems networking sub-disciplines. His research is consistently supported by the National Science Foundation, the Department of Transportation, and companies such as Bosch, ETRI, and Toyota.

The professor earned his PhD in 2002 from the Georgia Institute of Technology and today specializes in cognitive radio networks, vehicular communication systems, and next generation wireless systems, with a focus on algorithm design, medium access control protocols, resource management, and analysis of network architectures and protocols. He is a Senior Member of IEEE and a member of ACM.

ECE JOINS WHITE HOUSE ENERGY REDUCTION INITIATIVE



The Ohio State University is one of just two universities picked by the White House to cut waste and help double national energy productivity by 2030.

A total of $22 million in the Department of Energy's (DOE) "Next Generation Electric Machines" research awards went out this month to fund projects aimed at reworking the way the United States uses energy on a large-scale basis. The initiative comes via the Office of Energy Efficiency and Renewable Energy.

Ohio State electrical and computer engineering professor **Longya Xu** and his team are now in negotiations to receive approximately $3 million in funding over the next three years to help cut the cost of high-energy consuming industries, such as transporting fossil fuels and industrial-scale compression systems.

Xu has taught and researched electrical power systems at Ohio State since 1990. Acting as the Principal Investigator, in 2010 he helped establish the Center for High Performance Power Electronics (CHPPE), a $9-million Ohio State research group.

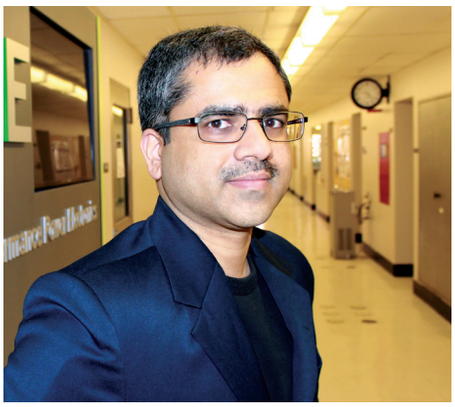
Ironically, Xu said, his team's initial DOE submission paper almost never made it past the front door, after it was recommended they withdraw their work. Unfazed, he said, the team submitted their project anyway. It soon rose to the top.

"It helps to have confidence in your research," Xu said.

Over the next 15 years, the DOE program aims to cut national energy waste by as much as 30 percent, plus reduce outputs used in the chemical and petroleum refining industries, natural gas infrastructure, and general industry compressor applications (HVAC, refrigeration, and wastewater pumps) by up to 50 percent.

The overall effort is part of the DOE's broader Clean Energy Manufacturing Initiative, which aims to increase American competitiveness in the production of clean energy products and boost U.S. manufacturing competitiveness by increasing energy productivity.

ILLINDALA WINS DEPARTMENT OF DEFENSE YIP AWARD



ECE Assistant Professor **Mahesh Illindala** was named among the Young Investigator Award winners from the Office of Naval Research (ONR).

The ONR Young Investigator Program (YIP) is one of the oldest and most selective scientific research advancement programs in the country. Its purpose is to fund early-career academic researchers, or investigators, whose scientific pursuits show outstanding promise for supporting the Department of Defense, while also promoting their professional development.

Illindala now receives a portion of the approximately $25 million awarded through ONR's 2016 YIP, which includes 47 scientists whose exceptionally creative research holds promise across a range of naval-relevant science and technology areas, from robotics to solar cells.

The title of Illindala's proposal is, "Design and Synthesis of Resilient Microgrid Systems."

His research explores the creation of a self-organizing and self-restorative framework for making microgrid systems resilient to unexpected disruptions. For example, the power system of an electric ship is an isolated microgrid, comprising of distributed energy resources (DERs). A failure in such systems would be detrimental.

"Next generation naval power systems have to support high combat capabilities, which will lead to increased energy and pulsed power loading," he said. "With the focus on energy security, such harsh demands call for alternative energy sources and new approaches to their integration. Adverse conditions occur in DERs supplying large and pulsed power loads. These conditions are caused when the DERs, due to the low inertial response, quickly reach their capacity limits."

Honoring more than 30 years spent as part of Ohio State ECE, professor **Patrick Roblin** was named a Microwave Distinguished Lecturer by the Institute of Electrical and Electronics Engineers (IEEE). Suddenly, he has a lot more travel plans.

Roblin will represent the Microwave Theory and Techniques Society (MTT-S), which serves more than 11,000 members and 150 chapters across the world. Only four members are picked annually to become Distinguished Microwave Lecturers.

Aside from the prestige that comes with being named an expert by his own peers, Roblin will give up to seven lectures per year to different MTT-S chapters throughout his 2016 to 2018 term.

"I will be traveling quite a bit," Roblin said. "I am excited to have the opportunity to lecture around the world and meet new microwave researchers and students who are working on wireless microwave/RF front ends."

With the advent of Nonlinear Vector Network Analyzers (NVNA), Roblin explained, new nonlinear measurement, modeling and design techniques have emerged, all of which are having a profound impact on his industry.

Originally from France, Roblin joined the Ohio State ECE department back in 1984. Today, he focuses his research within the realms of measurement, modeling, design, and linearization of non-linear RF devices and circuits - such as power-amplifiers, oscillators and modulators. He is also founder of Ohio State's Non-Linear RF Research Lab, and has developed two educational RF/microwave laboratories and associated curriculum for training both undergraduate and graduate students at the university.

IEEE FELLOW

For his multi-talented research efforts, ECE professor **Umit Çatalyürek** was named the newest IEEE Fellow now educating students at The Ohio State University.

ECE faculty member, **Ryan McPherson**, won the Ohio State 2016 Dean's Award for Outstanding Teaching by a Lecturer.

ECE Professor **Aleix Martinez** was named among the winners of the Summer 2015 Google Faculty Research Award for his software work helping to make learning American Sign Language more accessible. His project was selected out of 805 different proposals submitted for the Google Faculty Research Awards by scientists from across 48 countries and six continents.

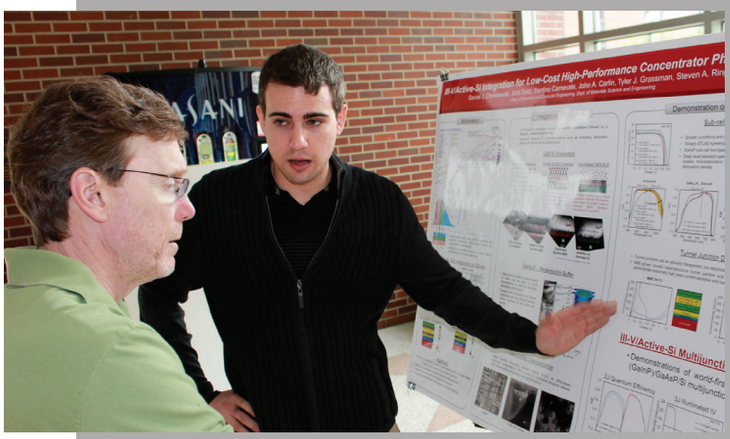
In the ever-progressing field of high-speed communications research, ECE student **Michael Wood** is racking up the awards for his work using the power of light to create faster and more effective computer systems.

Wood, a PhD student, recently won the prestigious Ohio State University Graduate School Presidential Fellowship for Autumn 2015. He also took first prize in the 2015 Emil Wolf Outstanding Student Paper Competition for his integrated photonics research.

"I am honored to win both of these prestigious awards," Woods said. "Taken together, they show recognition for my research work at both the general research community and within my narrow sub-field of integrated optics."

Wood specializes in silicon (Si) photonics, which involves carrying data as light signals through integrated optical waveguides, or nanoscale versions of fiber optic cables. He said it is one way engineers are able to provide larger bandwidths for high performance computing systems and data centers.

Regarding Wood's top research paper award, the Optical Society Foundation's (OSA) Emil Wolf Outstanding Student Paper Competition recognizes the innovation, research excellence and presentation abilities of students showing their work at the Frontiers in Optics Conference (FiO) and the OSA Annual Meeting.



ECE student **Dan Chmielewski** won the 2016 Kraus Memorial Poster Competition for his project, "III-V/Active-Si Integration for Low-Cost High-Performance Concentrator Photovoltaics." He is a graduate research associate at the Electronic Materials and Devices Lab.

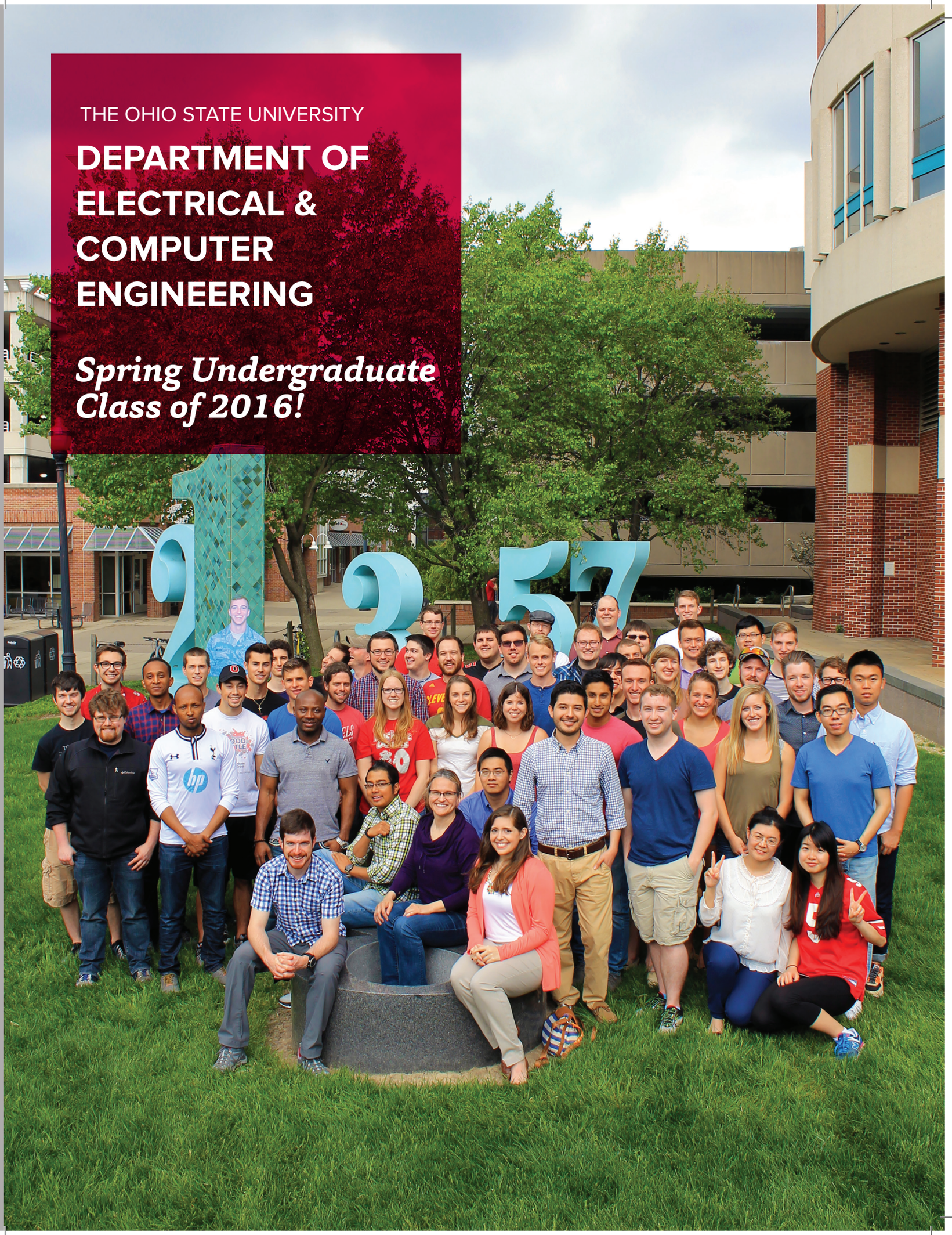
ECE Graduate Research Associate **Stephen Watt** won the prestigious National Defense Science and Engineering Graduate (NDSEG) fellowship, which is awarded to those students looking to pursue a doctoral degree in one of any 15 supported science and engineering disciplines of military importance.

IEEE announced ECE Professor **Jin-Fa Lee** received the prestigious Harrington-Mittra Award in Computational Electromagnetics.

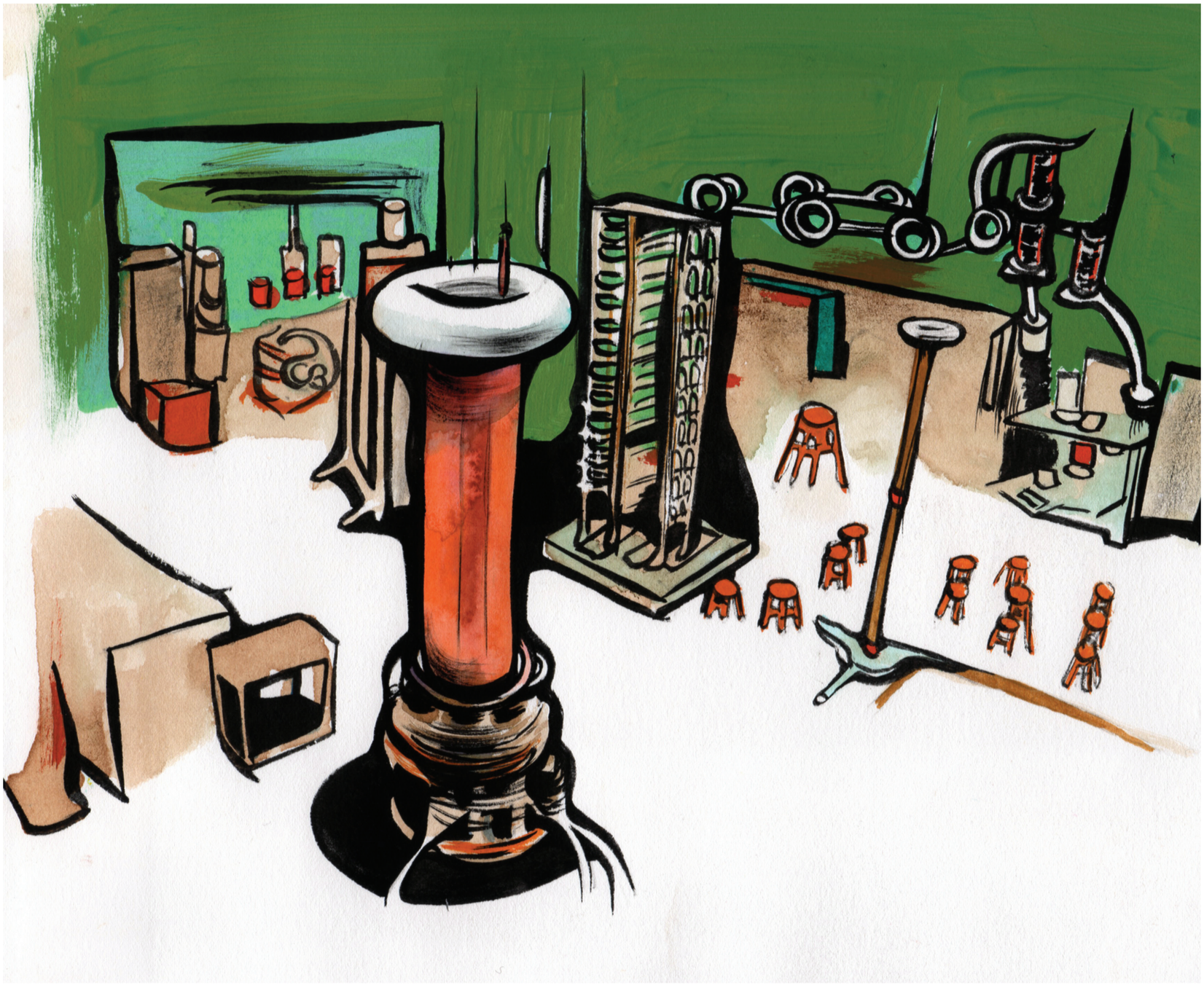
THE OHIO STATE UNIVERSITY

DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

Spring Undergraduate Class of 2016!



PICTURED: PAINTING OF THE HIGH VOLTAGE AND POWER ELECTRONICS LAB BY COLUMBUS ARTIST MEAGAN ALWOOD-KARCIC



"We are totally going to go out and stock up on supplies to teach kids about STEM. The lab will be a mess. This is great!"

Betty Lise Anderson, on page 34

SUPPORT

K-12 OUTREACH CAMPAIGN TOPS GOAL

One day a woman asked K-12 Engineering Outreach Director **Betty Lise Anderson** how she could help support the program financially.

To be honest, Anderson said, the question highlighted a need - there was no easy way to help.

Enter: The Ohio State University Buckeye Funder K-12 Engineering Outreach Campaign.

Anderson said if one person expressed a desire to help keep the outreach program going strong into the future, perhaps others might want to jump on board as well?

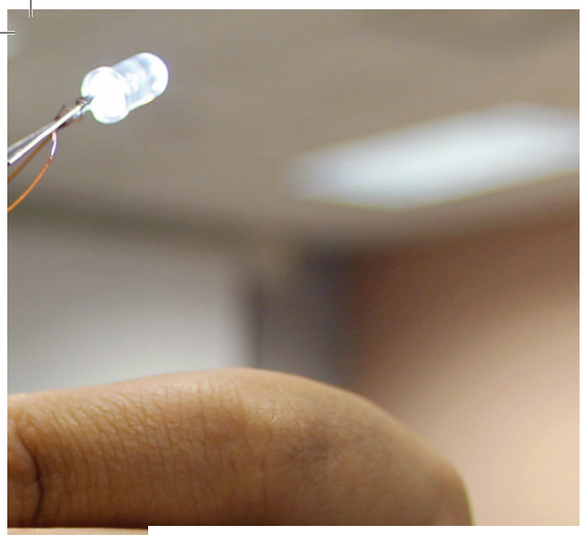
She was right. Throughout the entire month of May, the university community got a first-hand look into the K-12 program with videos, stories, photography and even a blog. In the end, not only were people generous enough to help meet the fundraising goal of $3,500, but they surpassed it and hit $4,220.

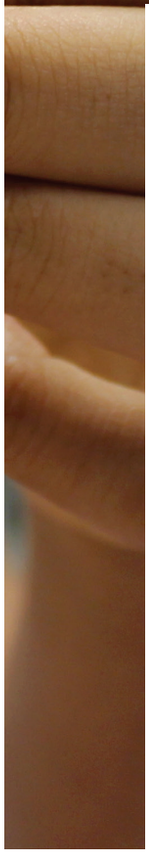
Anderson said she was "stoked" to see the effort succeed.

"Thanks for all your great support. You did it!," Anderson said. "We are totally going to go out and stock up on supplies to teach kids about STEM. The lab will be a mess. This is great!"

While the Buckeyefunder giving page is no longer active, donations to the page are still open to the ECE community (http://go.osu.edu/K12-fund) and those who donate will receive periodic updates on program activities.

"We will run out of tape and audio cables eventually," Anderson said. "Because we are now able to do projects that kids can take home *even more often*."





Since 2008, engineering students at The Ohio State University have visited K-12 classrooms, libraries, and summer camps to get kids excited about Science, Technology, Engineering and Mathematics (STEM). Volunteers bring all the materials on site, at no cost to the teacher. The program focuses on underserved communities.

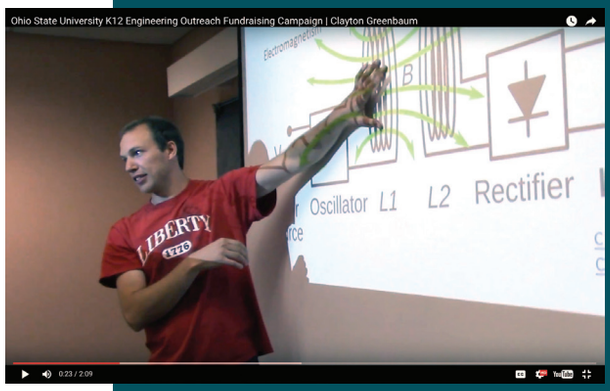
The STEM projects are designed to be cheap - really cheap - because Anderson said it is important for a kid to build something and then take it home. Each project demonstrates the application of different scientific principles, guiding children as they learn to build a working widget. The labs, all designed by Ohio State students, typically cost between $1 and $2 per kid - but her favorite, the paper speaker, is less than a dollar.

Ohio State's K-12 Engineering Outreach program has now visited over 90 schools and more than 65 libraries, camps, after-school programs, and the like. To date, its roster of 250 engineering student volunteers has reached more than 13,500 children.

The program has also won the Ohio State University Outreach and Engagement Award, the Distinguished Service Award, the College of Engineering Outreach Award, the Women in Engineering Faculty Award for Outreach and Engagement, and the Faculty Diversity Excellence Award. Program assistant, **Clayton Greenbaum**, even won the university's Distinguished Diversity Enhancement Award, as well as the Marian Wright Edelman Education Award. ■

Buckeye Funder K-12 Engineering Outreach Campaign Page:
https://buckeyefunder.osu.edu/project/2150

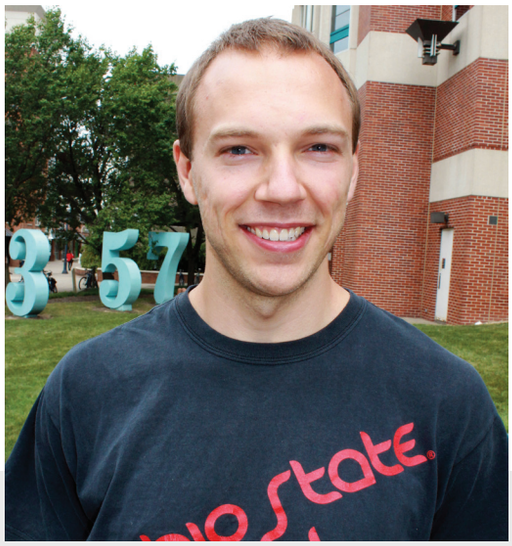
WATCH K-12 OUTREACH CAMPAIGN VIDEOS ONLINE



Program assistant **Clayton Greenbaum** discusses his passion for outreach:
http://go.osu.edu/greenbaum-vid

Student volunteer **Ryan Patton** talks outreach support:
http://go.osu.edu/patton

Watch the K-12 Engineering Outreach official fundraiser campaign video
http://go.osu.edu/K12vid



K-12 ENGINEERING OUTREACH

CLAYTON GREENBAUM

It was a good year for ECE student **Clayton Greenbaum.** He started the year off by placing among the top 10 at the 2015 OHI/O Hackathon as part of the Buckeye Current team. Then, he followed that up by winning a TechHUB Student Project Development Grant after successfully pitching a RoboZoo Hackathon concept with his teammate **Polina Brodsky.**

In October, The Ohio State University College of Engineering honored Greenbaum's many years, and countless hours, spent helping the K-12 Engineering Outreach Program, by presenting him with the Marian Wright Edelman Award.

To say Greenbaum is dedicated to teaching younger generations about the wonders of electrical engineering may be putting it mildly. He has served as K-12 Engineering Outreach assistant to director **Betty Lise Anderson** since 2011. Between them both, the program has reached more than 13,500 students and just recently earned the 2015 Ohio State University Outreach and Engagement Recognition Award, as well as the Ohio State Distinguished Community Engagement Award.

"He is the best person I have ever seen at explaining science concepts to even very young children," Anderson said, in her nomination letter for Greenbaum. "He is the best at convincing frustrated or reticent kids to complete the project and show they can do it."

Anderson said Greenbaum has helped with over 140 outreach events for the Electrical Engineering Department alone. He also volunteers with Tech Corp, the Ohio House of Science, the Women in Engineering Program, and the Minority Engineering Program at Ohio State. Greenbaum also runs a summer STEM camp at the Plain City Library.

Anderson said he volunteers "basically any chance he gets."

"In his spare time, he is constantly developing new STEM projects for kids and refining existing ones – the most recent is a wireless energy transfer project that makes an LED light up without ever touching the circuit with the battery," she said.

As one ECE alumnus said in passing about his work, "Does Clayton ever sleep?"

Greenbaum sees his work outside the classroom as an opportunity to give back.

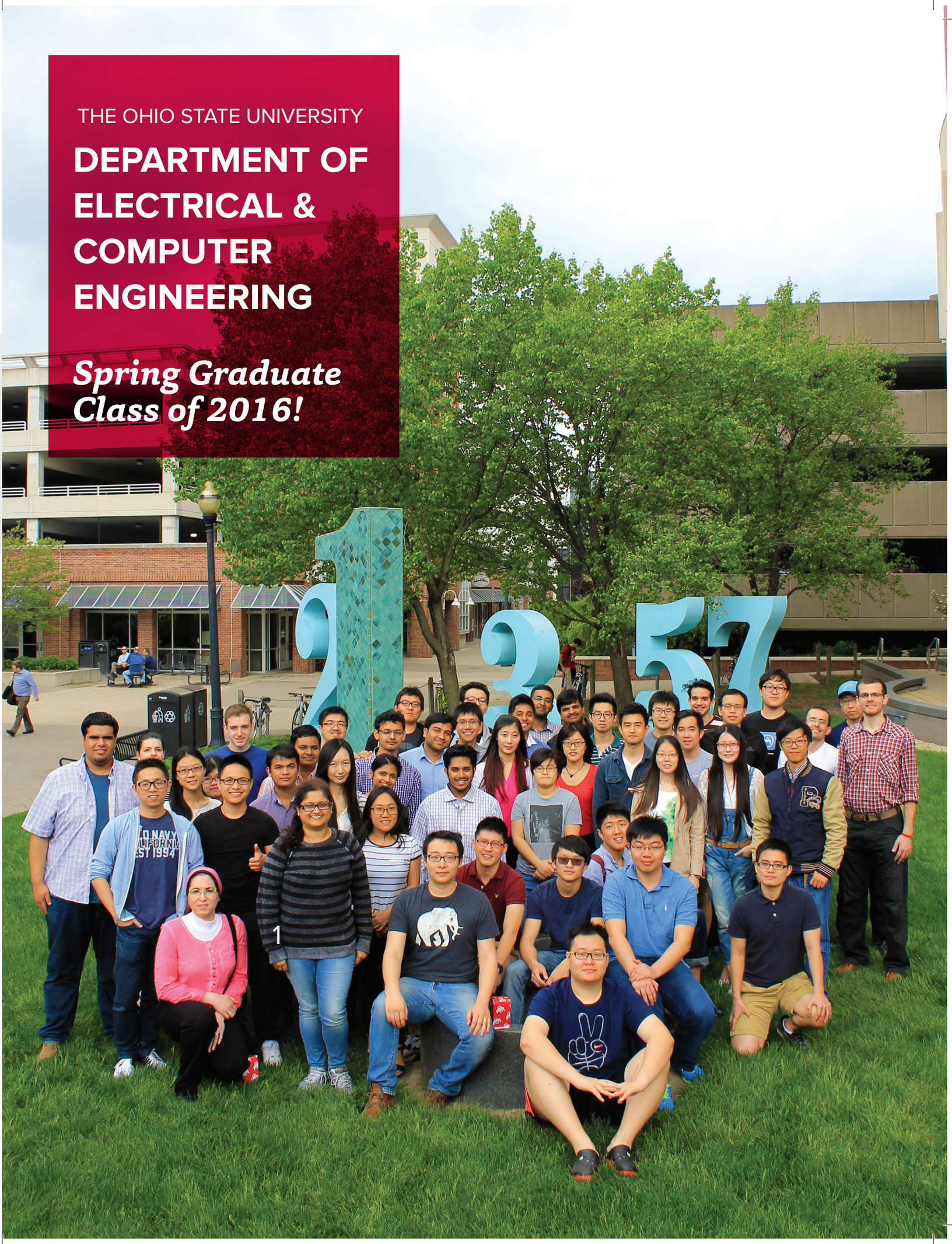
"I owe everything to the people, particularly scientists and engineers, who took the time out of their lives to reach out to me when I was a kid and I want to pay it forward."

He said their encouragement turned him from a troubled teen into a young adult with purpose. ■

THE OHIO STATE UNIVERSITY

DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

Spring Graduate Class of 2016!



ECE Campaign Committee

Rodolfo M. Bellesi
Co-founder/managing partner, IKOVE Capital Partners, LLC - MS, Electrical Engineering, Ohio State (2000); BS, Electrical Engineering, Federal University of Paraguay (1997)

Mark Morscher
Owner, C2R Consulting, LLC - BS, Electrical Engineering, Ohio State (1989)

Liza Toher-Reed
Proposal Developer, Great Lakes Energy Institute - BS (2006) and MS (2010), Electrical and Computer Engineering, Ohio State

Dr. Robert B. Dybdal
Retired, Engineer, The Aerospace Corporation - BS, MS (1964) and Ph.D. (1968), Electrical Engineering, Ohio State

Dr. Mark Frankford
Engineer, Northrop Grumman - BS (2004) and MS (2006), Electrical Engineering and Ph.D. (2011), Electrical and Computer Engineering, Ohio State.

Jim Sipes
Retired, Engineer, Quest/CenturyLink - BS (1965) and MS (1966), Electrical Engineering, Ohio State.

Robert Borel
CEO, BeamAlloy Technologies, LLC - BS and MS, Electrical Engineering (1965), Ohio State, MBA, University of Rochester (1974)

Dr. Tamer Ibrahim
Associate Professor of Radiology and Bioengineering at Swanson School of Engineering (University of Pittsburgh) - BS, Electrical and Computer Engineering (1996), MS, Electrical Engineering (1998) and Ph.D., Electrical and Computer Engineering (2003), Ohio State

Reza Norouzian
VP, Worldwide Sales and Business Development, ClariPhy Communications - BS, Electrical Engineering, Ohio State (1981)

Dr. Marvin White
Professor (Auxiliary) Electrical and Computer Engineering - Ph.D., Electrical Engineering, at Ohio State (1969)

ROBERT BOREL

Graduating in the class of 1965, alumnus **Robert Borel** is a longtime supporter of ECE events and department goals.

"I would say my motivation to stay involved is pretty similar to other alums," he said. "We value the education we got here, what prepared us for a professional career, and also for the value system that we've lived the rest of our life."

Many alumni have children ready to start college, he said, and they want them to have a similar positive time as they did while attending Ohio State.

"Ohio State provides such a multi-dimensional experience," Borel said.

Watch a short video interview with Borel at: **http://go.osu.edu/borel-vid**

"We value the education we got here, what prepared us for a professional career, and also for the value system that we've lived the rest of our life."

ECE Priorities

RECRUIT OUTSTANDING FACULTY:

The new faculty we are recruiting will perform cutting-edge ECE research to impact our future in autonomous vehicles, smart robotics, cancer treatment, concussion prevention/diagnosis, energy systems, and the internet-of-things. Support from our alumni is crucial for helping us to provide start up funds and endowed chair support to enable these innovations and endowed chair positions to attract outstanding new faculty.

STUDENT LED INNOVATION:

Our graduate students are the driving force behind Ohio State's research progress. Their success builds not only their future career, but also the university's reputation and our nation's critical technologies. Support from our alumni helps us to provide fellowships for the graduate program that enable these students to concentrate on their research rather than day-to-day financial concerns.

UNDERGRADUATE ACCESS:

Department scholarships enhance the ability of our students to pursue their dreams of an ECE education. These are especially important for the freshman and sophomore years, as students build their skills to pursue future internships and co-ops. We are proud of the generous support ECE alumni have provided to our undergraduate students and hope to build upon this success to further reduce college costs for deserving students in the programs.

MODERN LEARNING ENVIRONMENTS:

ECE facilities are meeting the needs of our student body, but face challenges moving forward. The replacement of Caldwell Laboratory is a long term goal; more immediate needs include smaller renovations of the Control Systems Laboratory, relocation of the electronics group, improvements in equipment for the sophomore teaching laboratories, enhancements to the laboratory space for our project-based master's program, and the creation of a "maker" space for our undergraduate students to pursue their innovative ideas. Alumni support helps us meet our facility needs going forward.

OTHER OPPORTUNITIES:

Several other opportunities exist for our alumni to make a significant impact. These include endowments to support annual awards recognizing outstanding performance by our graduate or undergraduate students, support for expansion of the ECE-led Humanitarian Engineering program (including support for students to participate in humanitarian projects) and support for the ECE K-12 Engineering Outreach Program that has already taught more than 13,500 young students across Ohio about STEM topics applicable to society.

SUPPORT

WAYS TO GIVE

There are many ways to give to the Department of Electrical and Computer Engineering, including establishing an endowed or support fund, or contributing to the ECE fund of your choice.

You can contribute directly to an ECE fund through The Ohio State University Online Giving secure website **giveto.osu.edu.** Visit our list of ECE department program support and scholarship funds to find out more: **ece.osu.edu/alumni/support**

NEW OPPORTUNITY

A generous gift left by Ohio State alumna Hazel Lodge (1938), helped create the new ECE Alumni Scholarship Fund. The endowment is now the main outlet for alumni financial gifts toward ECE student scholarships.

CONTACT US

Please contact **Katie Coen**, ECE Director of Development, at coen.40@osu.edu or (614) 688-2212, with any questions or to discuss giving opportunities.

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

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COME HOME AGAIN OCT. 1

CELEBRATE HOMECOMING WEEKEND WITH FELLOW ALUMNI

Join friends in the Department of Electrical and Computer Engineering and the EE/ECE Alumni Society for a pre-game Homecoming tailgate party, with a breakfast buffet and entertainment. The event runs from 9 a.m. to 11 a.m. on the patio between Knowlton and Hitchcock halls.

Game-plus-tailgate package
Each $107 game/tailgate package* includes one ticket to the Ohio State vs. Rutgers game, plus one ticket to the College of Engineering Homecoming pre-game tailgate. Tickets are available when you check in at the tailgate.
Note: We cannot mail tickets. A photo ID will be required at pickup. We cannot offer football tickets only.

Tailgate only
The cost is $20 per person. Children 9 and under are free. You may buy tickets via the College of Engineering online system at go.osu.edu/homecoming-2016.

Sponsor current ECE students to attend the tailgate
While registering for the tailgate package, you may wish to sponsor an ECE student to attend the tailgate for $20 per person.

Questions?
Call Carol Duhigg at (614) 292-7392 or email duhigg.2@osu.edu

**A paid $20 annual EE/ECE Alumni Society activity fee is required to be eligible to buy up to four game/tailgate packages. The activity fee is for calendar year 2016 and also counts toward your OSUAA sustaining membership requirement for 2017. In addition to the required EE/ECE Alumni Society activity fee, you must be an active member (Sustaining or Life Member) of the Ohio State Alumni Association. Alumni who are season ticket holders (whether in your name or your spouse's name) are only eligible to purchase two game/tailgate packages.*

Ticket Availability

Ticket packages are limited and available on a first-come, first-serve basis.

Registration is open!

Registration:
Register for the EE/ECE Alumni Society Homecoming by calling Ohio State Alumni Association's customer service desk at (614) 292-2281 or (800) 762-5646.