

Summer 2014

Bits & Sparks

The Ohio State University
Department of Electrical & Computer Engineering



THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Engineering change

Our successes are laying the groundwork for the future

As a new class of students enters The Ohio State University this fall, the Department of Electrical and Computer Engineering will be undergoing a major transition of its own with a new chair and some exciting new strategic initiatives.

It has been my privilege to serve as ECE chair since January 2007. I will continue in my role as Director of the Simulation Innovation and Modeling Center (SIMCenter). As I prepare to step down, I have been looking back fondly on how the department has grown and evolved.

Our successes are in large part thanks to the hard work of ECE's faculty, researchers, staff and students. We also recognize the support of the College of Engineering, the university, our philanthropic network and, of course, our dedicated base of more than 9,000 alumni living worldwide.

Here are just a few points of pride from the past seven years:

- We have climbed in the *U.S. News and World Report* rankings of the best ECE departments in the country from 26th in 2007 to 18th in 2014.
- Research into innovative technologies is critical to our success. We increased our research funding from \$12 million in 2007 to a peak of \$24 million in 2011.
- Since 2007, we have expanded our faculty by more than 20 percent, increased the number of female faculty members and female undergraduates, and grown our undergraduate enrollment from 650 to nearly 1,000 students. We also increased the number of our graduate students from fewer than 300 to more than 400.

We also have implemented several important changes to our curriculum.

For example, we launched the “flipped classroom” concept. Students prepare for class by studying taped lectures and other materials outside the classroom and use class time for more hands-on work and discussions.



We revamped our sophomore experience to ensure better student retention and higher caliber educational outcomes. And, along with the rest of the university, we successfully transitioned from a quarter-based system to semesters.

These changes don't begin to cover all our progress. We opened the new ElectroScience Laboratory building and the Center for High Performance Power Electronics. We received funding from the U.S. Department of Transportation to open a University Transportation Center to improve the safety of autonomous vehicles.

It has been an exciting time for the department. We are certainly not resting on our past successes, though.

The department will tackle even more exciting initiatives thanks to the new five-year strategic plan developed by our faculty and incoming department chair, Joel T. Johnson, who takes over this position in September.

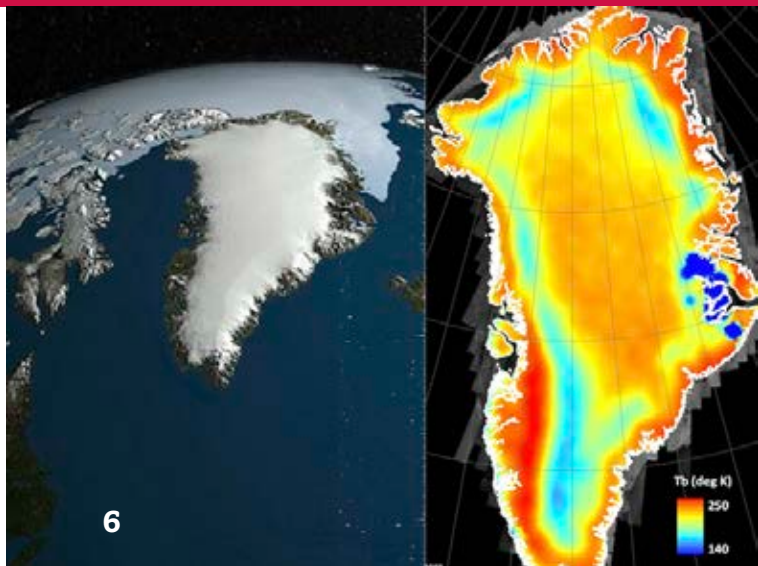
You can read about some of our recent accomplishments, as well as get an overview of some of the key elements of the strategic plan, inside this newsletter.

For now, allow me to express my appreciation to all the people I have worked with and who have supported me in my role as department chair. To the faculty, researchers, staff, students, alumni, industry supporters, and everyone at the college and university, thank you.

It has been an exciting seven years here in ECE, and it looks as if the future will be just as vibrant.

A handwritten signature in black ink that reads "Robert Lee".

Robert Lee
Department Chair



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Bits & Sparks

Summer 2014

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University President

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Effective Sept. 1, 2014

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Catching the waves



Professor John Volakis

Research aimed at less invasive study of brain signals

Doctors who diagnose and treat people with chronic neurological disorders such as Parkinson's disease and epilepsy could have a safer, more convenient and less invasive way to monitor patients' brain waves, thanks to new research led by The Ohio State University.

The researchers, funded by a four-year, \$2 million grant from the National Science Foundation, aim to develop technology that wirelessly collects and records brain waves, according to John Volakis, professor of electrical and computer engineering and director of the ElectroScience Laboratory at The Ohio State University.

Volakis is leading a multi-disciplinary team of Ohio State researchers in collaboration with Arizona State University. Their plan is to develop passive, biocompatible sensors – conceptually similar to those implanted into pets for identification purposes – along with an unobtrusive,

wearable system that receives, records and transmits brain wave information to health care providers. The research could improve the diagnosis, monitoring and treatment of patients with Alzheimer's diseases, seizures, brain injuries and any number of other neurologic issues. The results might even be applied to help patients control prosthetic devices.

"Overcoming the challenges in safety and long-term reliability presented by conventional neurosensor technology could transform health care for people suffering from severe chronic neurological disorders," Volakis said.

Reading brainwaves is nothing new. However, it currently involves invasive, inconvenient and potentially dangerous surgical procedures. The associated technologies involve wires that directly connect to implanted sensors that are much larger than the one proposed by Volakis and his team. This requires the patients to be immobilized.

It also hinders doctors' ability to monitor patients in real time during their typical daily lives.

Volakis and his team envision a better approach. "We know the signals exist. We just can't read them right now without having patients wired to external monitors. The key is to be wireless and less invasive."

The proposed system could allow patients to go about their normal daily activities, not even knowing the sensors are operating.

The implanted wireless neurosensory device will be less than two centimeters long. It will be placed on a patient's dura mater, a strong membrane covering the brain. The biocompatible sensor is similar to the kinds of radio frequency identification devices (RFIDs) used for a variety of purposes, ranging from identifying lost pets to consumer product inventory control.

The neurosensor will be fully passive, meaning it has no battery or other energy source that could create potentially dangerous heat inside a patient's brain. That will reduce the chance for brain injury and trauma. It also will remove the need for attached wires.

'With this research, we envision a huge new world in the study of brain signals.'

— John Volakis

All of this implies a much less invasive surgical procedure than any existing approach.

Data from the neurosensors will be remotely collected by a wearable "body area network." The BAN will involve clothing – a hat and shirt, for example – that safely stimulates the brain sensor and wirelessly extracts the collected data. The external devices in the clothing will be made of unobtrusive textile antennas, a tiny WiFi chip, and an RF power harvester.

The textile antenna is thin and pliable enough to be used like a thread. It is sewn into the fabric of a patient's clothing. The RF harvester captures ambient radio frequency energy from its surroundings and converts it into the small amount of direct current electricity to power the body area network.

Data about the patient's brain waves are then transmitted by the WiFi chip to health care providers, perhaps via a smart phone or laptop. The entire system would weigh less than a few ounces.

The research will be performed by a multidisciplinary team from Ohio State and Arizona State University. Volakis will focus on the wireless communication and power harvesting. Research into the behavioral, psychological and health impact of acquired data will be performed by Julian F. Thayer, professor of psychology at Ohio State. The design and implementation of the neurosensor will be performed by Junseok Chae, Arizona State associate professor of electrical and computer engineering.

"With this research, we envision a huge new world in the study of brain signals," Volakis said.

In memorium: Robert B. Lackey

Robert Bush Lackey, associate professor emeritus from The Ohio State University Department of Electrical and Computer Engineering, passed away on Nov. 4, 2013.

Lackey began teaching at Ohio State as an assistant professor in 1961. He retired in June 1983 as an associate professor. He received his BS and MS degrees in electrical engineering from Ohio State in 1954 and his PhD in electrical engineering from the university in 1961.

Lackey, 81, was a veteran of the U.S. Navy, past president of the Clintonville Community Band, a member of the Lower Dixieland Band and former member of The Ohio State University marching band.



Retirement: Ali Keyhani

Ali Keyhani, professor of electrical and computer engineering, retired in 2013 after 32 years of service.

Keyhani is a fellow of the IEEE and was a recipient of The Ohio State University College of Engineering Lumley Research Award for 1989, 1999 and 2003. He is the past chairman of the Electric Machinery Committee and past editor of the journal IEEE Transactions on Energy Conversion.

Keyhani received his PhD in electrical engineering from Purdue University in 1975 after graduating in 1971 with an undergraduate degree from Ohio State. He came to Ohio State as a visiting professor in 1980, became a tenure-track assistant professor in 1981 and an associate professor in 1984. He became a full professor in 1990.



Into the deep

NASA grant lets Ohio State test deep-ice temps

Researchers at The Ohio State University are leading a project to develop technology that can determine temperatures deep under Greenland's ice sheet from airplanes – or even potentially from spacecraft.

The data resulting from the use of a specially designed microwave radiometer could provide a glimpse into the potential impacts of climate warming on sea levels in the world's oceans.

"The ice sheets of Greenland and Antarctica play an important role in the global climate," said Professor Joel Johnson of Ohio State's Department of Electrical and Computer Engineering and the project's primary investigator. "They contain about 70 percent of the world's fresh water, and gauging temperatures deep beneath their surface is a critical way to predict how they might evolve in the future."

The research is being funded by a \$3 million, three-year grant from NASA's Science Mission Directorate as part of its Instrument Incubator Program (IIP-13) in support of its Earth Science Division. IIP-13 will provide funds to develop instruments and instrument subsystems that will enable future Earth science measurements and visionary concepts.

Johnson will lead a multidisciplinary, multi-university team of researchers working on the project titled "UWBRAD: Ultra Wideband Software Defined Microwave Radiometer for Ice Sheet Subsurface Temperature Sensing."

"The data we collect will enhance the research community's ability to determine how ice deforms internally and how quickly an ice sheet flows across its base," Johnson said. "It also will help us compile mean annual temperatures and monitor climate change."

Professor Ken Jezek, a glaciology expert with The Ohio State University Byrd Polar Research Center, said using radiometers to record naturally occurring microwaves would be vastly more efficient than current techniques.



Joel T. Johnson

"Presently, our only direct knowledge of ice sheet internal temperature is from measurements in boreholes," Jezek said. "But boreholes to the base of the ice are few across the expanses of Greenland and Antarctica."

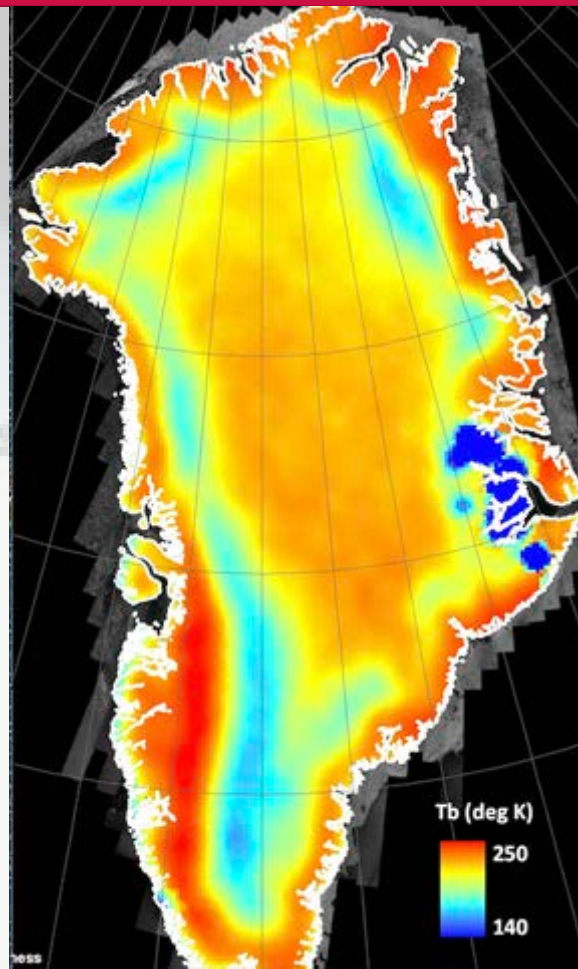
Building a microwave radiometer that can be used to perform ice sheet thermometry from an airplane or spacecraft would be faster, cheaper and allow for readings over much greater geographic areas. This concept is routinely used to measure temperature in the atmosphere, but has never been applied to ice, Jezek said.

Johnson will design a specialized microwave radiometer that will receive the naturally occurring low-frequency microwaves given off by the ice sheets. Because microwaves at different frequencies carry information about different depths in the ice, it should be possible to determine the temperature of ice hundreds of meters below the surface without boring holes.

The envisioned microwave radiometer should be able to get the same information from an airplane flying over the ice sheets.

The colder the ice is, the stiffer it is. The warmer the ice, the faster it will flow. Consequently, knowing the temperature of the ice at different depths is central to modeling ice sheet behavior.

"These ice sheets are a mile thick," Johnson said. "It's hard to know what their temperatures are without extensive drilling. And these temperatures matter."



The heart of collaboration

When Bradley Clymer was an undergraduate student at The Ohio State University 25 years ago, he considered focusing his scientific interests on a career in medicine – and quickly decided that might not be his ideal career path.

“I don’t thing I could have gone through cutting up cadavers and that sort of thing,” Clymer said, laughing. “Fortunately, my current work allows me to apply my love of engineering and mathematics to make contributions to medicine and human health.”

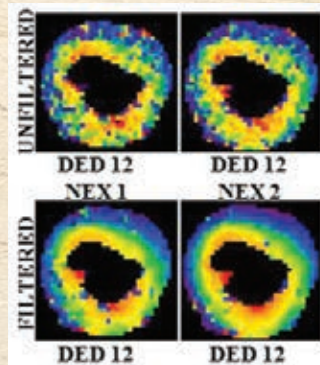
Clymer, associate professor of electrical and computer engineering, is focusing much of his time outside the classroom on medical applications of electrical engineering. He is collaborating with a professor of medical physics in the College of Medicine’s Division of Radiologic Sciences and Therapy, using MRI to study the mechanical tissue properties of cardiac muscles.

Clymer explained that different cardiac muscles have different mechanical properties in different directions. Studying those constantly moving muscles requires specialized MRI techniques, which is where Clymer’s electrical engineering expertise comes into play.

“The nice thing about MRI is that it’s not invasive, so you can repeat it multiple times,” he said. “It doesn’t really interfere with the processes of the cardiac muscles that we’re trying to observe. Unlike tests involving radiation, you can repeat it as often as you care to without risking injury to the patient.”

The orientation of the muscle fibers in the miocardium and the cardiac muscles are key to the electrical and mechanical properties in the heart, Clymer explained. By studying how the muscles of a normal, healthy heart work it will be easier to see how diseases affect those muscles and evaluate the effects of various treatment strategies.

Because of the length of time it takes and the complexity of synchronizing an MRI with a moving heart, the current research is being done on animals. It will be some time before human tests are practical. But bringing an engineer like Clymer together with medical professionals creates some important synergies.



Images from a cardiac MRI

Faculty profile

Bradley Clymer

Associate Professor of Electrical and Computer Engineering;
Associate Professor of
Biomedical Engineering

Education

BSEE Degree (1981) and
MS Degree (1982) from The
Ohio State University; PhD in
Electrical Engineering from
Stanford University (1987)

Teaches

Medical imaging for seniors and graduate students,
sophomore sequence, introduction to electrical
engineering principles, signals and systems



“For a long time I have thought the biggest advances in medicine and engineering are going to be in areas where those two disciplines interact with each other,” Clymer said. “Often, people working in medicine use technology without really understanding how it works. This kind of collaboration gives the engineers a chance to teach medical professionals the underlying physical principles and mathematics, and the medical professionals have the chance to teach the engineers how some of this science might be useful in a medical practice.”

For Clymer, this side of his work is rewarding in that it’s an opportunity to apply math to physical principles in real-world applications that benefit the world. That’s not to say Clymer doesn’t find the other side of his work – teaching – to be equally rewarding.

“I enjoy seeing the light bulb go on,” he said. “I especially enjoy teaching undergraduate students. I enjoy seeing the moment when they get it. And, in reality, research is really teaching. Very few faculty members do research on their own. We teach graduate students how to do research. I enjoy teaching graduate and undergraduate students how to formulate problems – how to identify what the problem is, propose a solution to the problem and verify that the solution is workable. That also means teaching students that there are lots of dead-end paths, and that that’s OK.”

Reaching out

Inspiring women, minorities to enter STEM

In grade school, teachers tell their students the sky is the limit and that they have the capacity to change the world. One professor would argue that the sky isn't the limit and that students can change the world around them, quite literally.

Betty Lise Anderson, professor of electrical and computer engineering, thinks the world needs a diverse community of engineers. She now leads Engineering Outreach, a program in the Department of Electrical and Computer Engineering focused on building interest in female and minority students in 78 schools, after-school camps and STEM clubs in and around Columbus.

"There are those who say we're facing a shortage of engineers in the United States. So, who's going to fill those jobs? If only white males are filling them, then you're missing more than half of the potential candidates," Anderson said.

During an event, Anderson and her student volunteers teach children how to build their own projects, including motors, CD spectrometers, heart monitors and speakers.

"What I like about (the speakers) is that the kids get to keep them because it's so cheap," she said. "The two magnets are 10 cents apiece and the wire costs about 35 cents. The rest is just paper and cardboard."

The speaker project is a favorite of Clayton Greenbaum's, a fourth-year student in electrical and computer engineering and one of Anderson's volunteers.

"I think anybody can make a speaker and make it well," he said. "It's like you're teaching a piece of paper how to sing. It's like magic."

The Engineering Outreach program came into fruition in 2008 when ECE Chair Robert Lee recognized the need for more women and minorities in engineering.

Lee asked Anderson to be the outreach chair for the program in hopes of inspiring more children to take an interest in the engineering field.

"If you look at the numbers, right now I think electrical engineering is up to 12 percent women from 6 percent when I started this," Anderson said, "and I think the percentage of



Professor Betty Lise Anderson's outreach program has reached more than 7,000 students in the past five years.

African Americans is in that ballpark."

These low numbers are consistent around the country for women and minorities in electrical and mechanical engineering and computer science.

According to Anderson, chemical engineering has the most women in its practice, but the percentage is still less than 50 percent.

Edwin Lee, a graduate student studying electrical engineering, is an African American who has worked with Anderson on the program before.

"The kids are always really excited," Lee said. "Every kid has a cell phone. So when you bring cardboard, wire, straw and glue and you make a speaker that you can actually hook up to your phone and play your music on it, there's something really exciting about that."

Greenbaum believes that for him, Engineering Outreach is less about the politics and more about the kids.

"I think it's great to try to foster interest in minorities and females, but I just do it for any kid. It doesn't really matter what race or gender they are," he explained. "Kids are really fun and you never know what to expect."

Article by Desiaire Rickman, onCampus

In Control

Alum joins NASA flight director team

Jeffery Radigan, a graduate of The Ohio State University, has been chosen as one of a select group of human spaceflight leaders in the Christopher C. Kraft Jr. Mission Control Center at NASA's Johnson Space Center in Houston.

He is one of three new flight directors selected to manage International Space Station (ISS) operations and one of 26 active flight directors supporting the space station, exploration, commercial spaceflights and new technology demonstration initiatives.

Along with fellow flight directors Amit Kshatriya and Zebulon (Zeb) Scoville, Radigan will oversee U.S. commercial cargo spacecraft and American commercial crew transports as they arrive at and depart from the space station. The trio will help ensure the crews of the orbiting laboratory have what they need to conduct scientific research that is providing real benefits to people on Earth and allowing NASA to be better prepared for long-duration exploration in deep space as it develops the Orion spacecraft and its Space Launch System heavy-lift vehicle.

What roles will you be playing in this new position, and how does that fit in with the other flight directors?

As a flight director, I lead the ground team and on orbit crew to accomplish the mission objectives. I am assigned primarily to support the International Space Station (ISS) although there are other flight directors assigned to support the Orion vehicle and our commercial partners.

How did your education at Ohio State prepare you for a position like this with NASA?

Ohio State provided a solid foundation for me to build my knowledge on once I graduated. A vast majority of spacecraft systems are computer controlled, and my classes at Ohio State emphasized the entire control path from the sensors and end effectors, all the way up to the control software.



Jeff Radigan received his BS in ECE in 2003 and his MS in 2005 from The Ohio State University.

Was working for NASA something you had always hoped for, or was this an opportunity you saw and decided to take advantage of?

It was both. I grew up fascinated with space and manned spaceflight and knew from the time that I was a little kid that I wanted to be an engineer. When I got to Ohio State I actually started in aerospace engineering. I found that I enjoyed computers more than fluid dynamics and switched over to electrical and computer engineering. At that point I wasn't sure I'd end up in the space business, but I found an opportunity to work on the ISS electrical power systems and that is how I got started at NASA.

What do you think is the importance of the space program today and into the future? What difference does it make that the U.S. is supporting programs like the space station, commercial space flights and similar projects?

Our space program today is one-of-a-kind. The research that we're doing in zero-G, the work that we're doing to learn how to live for long periods of time away from Earth, and the development we're doing on new vehicles to take humans farther away from Earth than we've ever been is incredibly exciting.

The partnership NASA has formed with commercial companies is the next step in the evolution of space flight. Just as air travel migrated from research centers to commercial companies, flying to low earth orbit (LEO) is something that becomes more frequent every year. It allows commercial companies to lower the cost to orbit of cargo and allows NASA to continue to develop technologies and spacecraft in areas that are not yet commercially viable.

If given the opportunity, would you want to go into space yourself?

Absolutely! But I can't stress enough how much of a team effort it takes to successfully launch, fly and land a spacecraft. The ground teams we have at NASA are some of the most professional and hardworking people I know.



Power to the People

Ohio State humanitarian engineering brings lights, electricity to Haiti school

While many students spent spring break basking on the beach, seven engineering students spent their time bringing light to school children in Haiti.

The seven were part of a larger group of 24 Ohio State students that included majors in education, logistics, Chinese and international policy who went to Haiti as part of Professor Terri's Buci's Haiti Empowerment Project.

The students — who are members of the Solar Education and Outreach club — participated in a multidisciplinary service learning project on the island nation. The engineering students' role for the weeklong trip was to install solar panels that would supply power for lights and other needs at a school in the inland town of Fauge. The engineering team's advisor is Professor Paul Berger.

For sophomore Amanda Broseus, this was the second year she participated in the Haiti effort.

"We did some workshops beforehand, and everybody was prepared to contribute to every aspect of the project," she said. She also had traveled to Haiti in December to determine what kind of project the group should do and what resources might be needed.

Photo left: Jason Mulligan, Ryan Van Soelen and Kan Liu install an electrical box as part of their team's efforts to bring solar energy into the Haiti classrooms.

Photo right: Amanda Broseus connects electrical wiring on the roof of a school in Haiti.

"I was interested in doing this as service learning and to apply the engineering knowledge I've learned in class. It put us on the spot for problem solving. You can't get that in a classroom," Broseus said. "Plus, I wanted to grow as a person and learn about different cultures."

The first few days in Haiti were spent finalizing plans and getting needed supplies that had not been shipped in advance or brought to the island by the students. They installed three solar panels, lights in two classrooms and the office, and junction boxes and outlets.

This was junior Kan Liu's second learning trip, but first trip to Haiti.

"This taught me a lot about collaborating with other people," Liu said. "If this had only been a group of engineers, everyone would have had a common goal and we could have coordinated that, but the different groups of students had different goals. We had to coordinate our activities and the use of resources."

For example, while the education majors were working with students and teachers in the classrooms, the engineers were limited in the work they could perform because of the noise and distractions their efforts produced. If one group took the car to purchase supplies, the other groups might have to adjust their plans.

Jason Mulligan said there also were logistical challenges and limitations associated with roads in Haiti. The time commitment for acquiring supplies was multiplied because of the lack of access.

"I was impressed by everything you can accomplish as a team," said freshman Nathan Bratcher. "We had different perspectives, even though we're all engineers, so I really liked how we worked together and how we talked out issues."

Bratcher said the students definitely made a difference to the school and the community by the time it completed the project Friday.

"The school is in a really nice area of the countryside, but it's not connected to an electric grid," Bratcher said. "It was



really gratifying to see the lights turn on, to see this chance for the students and teachers to have access to a better school, and the excitement of the crowd."

A simple thing like having lights in the school will open more doors of opportunity in the community, Mulligan said. For example, it will allow students and teachers to stay in the building after dark to study and work.

"Even the first night after we finished, one of the teachers was staying late to work because she had light," Mulligan said.

Roger Dzwonczyk of the College of Engineering's EEIC Programs said this type of humanitarian engineering is becoming more prevalent for students.

"Service learning mixes classroom experience with a meaningful service project," he said. "I think the idea of taking what you learn in the classroom, the equations and the drawings and the concepts, and being able to put them to practical use really strengthens the lessons they've learned. There are three billion people in the world who don't have electricity. Haiti has electricity, but it's only on for two hours a day where we were. The work these students did has long-lasting, clear benefits for the people of Fauge."

The capstone that brought this experience home for the students occurred on the last day in the country, when they gave a presentation about their efforts to their peers at Université Lumière.

"A dean thanked us for not bringing money, but for bringing education," Broseus said. "The money is gone instantly, spent on nothing, really. But the education will last and they can really do something with that."

Engineering a better world

Alumnus using engineering skills to fight human slavery

The mathematician Archimedes famously said, “Give me a lever long enough and a fulcrum on which to place it, and I shall move the world.”

Taken literally such a lever would be impractical, but engineers have the skills and knowledge needed to develop and apply technology that act as figurative levers to move the world in ways that dramatically help humankind.

One excellent example of that can be found in The Ohio State University alumnus Songsdhit “Joe” Chongsiriwatana, who is using his knowledge in the fight against modern-day slavery.

Chongsiriwatana clearly recalls the day he was tutoring a young girl in subtraction and addition.

“She asked me, ‘If a bad man stole your daughter from you and did bad things to her, what would you do?’ I felt such a deep sorrow to hear her question, because I knew she was asking from her personal experience. As a father of two girls, I could not even make myself contemplate the possibility of them going through what this girl had to endure.”

Chongsiriwatana, who graduated with a MS in biomedical engineering in 1998 and a BS in electrical engineering in 1996, works with the organization ZOE to help save children from his native Thailand and other countries.

“I frequently apply engineering skills to help the organization accomplish its mission,” he said. “I also interact with orphans and survivors of child trafficking. Whenever I have the opportunity, I love to tutor them in math and science, help them with homework, or simply try to show them how science is exceedingly cool.”

In 2013, he was honored for his efforts by the College of

Engineering with a Distinguished Alumni Award (See related story, Page 17).

“When I was in school at Ohio State doing electrical engineering we thought slavery was something that passed a long time ago, especially in America and other developed countries,” Chongsiriwatana said. “The fact is, the enslavement of children still exists in the form of forced labor, forced prostitution, begging rings...and children being used as child soldiers.”

Another important aspect of his education at Ohio State was his involvement with a campus Christian group.

“At the root of my motivation to fight child slavery is the Christian conviction that Jesus loves all these children and wants them to be protected. Ohio State was a place that had room for religious expressions, including compassion, and did

not treat these as irrelevant from academic life. Without that experience, I doubt that I would be doing what I am doing today.”

The International Labour Organization has estimated there may be as many as 1.2 million people in slave labor worldwide. As Chongsiriwatana became more aware of the need to stop this crisis, he realized there were many ways he could use his education that would be incredibly beneficial.

“At first, I was thinking, ‘Oh, what can I do?’” Chongsiriwatana said. Then, he thought about all the ways a background in engineering and technology could be

** Photo courtesy of ZOE. ZOE protects its children’s identity and dignity at all times. Media may show orphaned or at-risk children but never trafficked children.*



Songsdhit “Joe” Chongsiriwatana speaks at a ZOE boys youth camp.*

applied to solving the problems tied to human trafficking. Such projects required data management, quality control and project coordination. Schools and other buildings had to be constructed. There were needs for computer experts. Because of the complexity for ZOE to track all its cases, Chongsiriwatana set up a database for the child rescue team's use. Using technology helps the organization identify child trafficking hot spots in Thailand.

"We are thinking of child rescue processes a bit like sales management," he said. "It's kind of weird to think of it like that, but it kind of matches. You try to find a child and you have to track the case. It gets pretty complicated."

Chongsiriwatana's work is just the tip of the humanitarian iceberg. At Ohio State alone, there are student engineering

organizations doing numerous service projects in the community and faculty research into technology that can address societal problems. The university also has educational resources to train future engineers to support humanitarian causes around the world.

"We need people from all disciplines. We need people from medicine, from accounting. We need administrators. We need engineers. In the end, you need boots on the ground," Chongsiriwatana said. "You need people who go and help identify these children, who work with law enforcement and social services."

For more information about humanitarian engineering activities at Ohio State, visit osuhe.engineering.osu.edu/. For information about ZOE, visit www.gozoe.org.

In good company

College honors four ECE alums

Four alumni of the Department of Electrical Engineering were among those honored as recipients of the 16th Annual Excellence in Engineering & Architecture Alumni Awards, presented in October.

Each year the College of Engineering honors alumni for extraordinary personal achievements, remarkable contributions to the field of engineering or architecture, or outstanding service to the college.

Thomas L. Thomas (BS '66, MS '66, electrical engineering), retired chairman and CEO of EJustice Solutions, received the Benjamin G. Lamme Medal, the highest honor bestowed by the college for meritorious achievement in advancing engineering. The Ann Arbor, Mich., resident is the former owner and CEO of Creative Solutions, Inc., which he helped grow into the leading supplier of integrated software applications for U.S. public accounting firms before selling it to Thomson Reuters in 1998.

Tamer S. Ibrahim (BS '96, MS '98, PhD '03, electrical engineering), William Kepler Whiteford Associate Professor in bioengineering and radiology at the University of Pittsburgh, received the Teknikoi Outstanding Alumni Award, honoring achievements since graduation. The



Thomas L. Thomas



Tamer S. Ibrahim



Robert J. Borel



Songsdhit "Joe" Chongsiriwatana

Sewickley, Pa., resident's work has challenged old and established theories in magnetic resonance imaging (MRI) and led to new radio frequency techniques such as RF shimming and subject-insensitive RF transmit arrays.

In addition to these awards, two alumni were presented Distinguished Alumni Awards in honor of their outstanding professional achievement in engineering:

Robert J. Borel (BS '65, MS '65, electrical engineering) is CEO of private engineering firm BeamAlloy Technologies, LLC, in Plain City, Ohio, and a retired Worthington Industries executive.

Songsdhit "Joe" Chongsiriwatana (BS '96, electrical engineering; MS '98, biomedical engineering) moved his family to Thailand where he applies his engineering talents to stopping child trafficking and helping rescued children through his work at ZOE International.



Improve. Enrich. Promote. Grow.

Updated Strategic Plan charts course for future

Editor's note: On Sept. 1, 2014, Professor Joel T. Johnson will become chair of the Department of Electrical and Computer Engineering. Johnson and members of the faculty have outlined a 5-year strategic plan for the department.

The Department of Electrical and Computer Engineering has made significant progress toward its goals during the last five years.

Successful faculty hires, major new research programs, and a dramatic growth in enrollment all have contributed to improving the department's reputation and impact.

It is critical that we continue this progress with a thoughtfully developed plan to ensure we are enriching and advancing our educational program, improving our research reputation, ensuring our faculty and students

represent a depth of diversity, growing our department resources, and optimizing the use of those resources to support our goals in education, research, and service.

We also know we cannot manage what we cannot measure. To that end, we are striving to ensure our goals are specific, measurable, attainable, realistic, and time-appropriate.

For our charted course to achieve our stated goals, our faculty and staff must be engaged and accountable for our success.

A successful strategic plan requires two fundamental components. It must be designed around a strong and compelling vision that provides context and identifies overall direction and goals.

*Find the complete plan at
<http://go.osu.edu/jAs>*

Second, the organization needs strategies to achieve that vision and the capacity and will to execute those strategies.

Our overarching goal is that The Ohio State University Department of Electrical and Computer Engineering will be recognized internationally for the quality and impact of its research, teaching, and service.

The department will be the major contributor in achieving the strategic goals defined for College of Engineering and will be a key asset to the university becoming the premier public university in the United States.

The knowledge we create and disseminate will stimulate economic growth in Ohio, the nation, and the world.

The department will perform world-class research, will recruit and retain distinguished faculty, and will attract, educate, and graduate outstanding students.

It will be a catalyst for the development of Ohio's technology-based economy, especially in sectors related to electrical and computer engineering.

Collaborations with the private sector will enhance research, transfer ECE technology that addresses important technological challenges and promotes Ohio's Information Age economy, and provide "real-world" experiential learning for students.

The department will discover, develop, and document fundamental new engineering and scientific principles.

It will be recognized as a center of excellence for pioneering research and scholarship in electrical and computer engineering.

Our students will learn in a diverse environment characterized by professional conduct and scholarship. The quality of our physical facilities will be consistent with our pursuit of excellence.

Our graduates will be aggressively recruited for their valuable education.

Our alumni will become recognized for their abilities, leadership, creativity, teamwork, adaptability, focus on quality, and capability for lifelong learning.

Performance Goals

Enrich and advance our educational program

- Assess and refine the curriculum
- Build partnerships with international universities and industries
- Expand distance learning opportunities

Improve research reputation to the level of the top 10 in the nation

- Enhance department culture; reward (and support system to promote) research growth, especially the growth of centers
- Recruit outstanding faculty via success in Discovery Themes and other college/university initiatives
- Promote visibility of our research strength and impact

Promote a representative faculty and student body; increase our stature and public awareness

- Increase representativeness of ECE students, faculty, and staff
- Expand public relations activities
- Expand outreach activities

Grow departmental resources and optimize their use to support goals in education, research, and service

- Allocate significant efforts to ensure we achieve success in development
- Hire and retain the best faculty members
- Provide excellent customer service to faculty, staff, students, alumni and the community
- Expand and improve facilities

One critical area to our success from 2014-18 will be faculty recruitment, particularly in the areas of

- sensing and information
- energy efficient electronics and systems, and
- computation and cyber-physical systems.

These areas combine strengths from across the ECE discipline to achieve high-impact results in a variety of applications.

Each of our strategic areas is also closely aligned and integrated into Ohio State University's three Discovery Themes: Health and Wellness, Energy and Environment, and Food Production and Security.

During the next 10 years, the Discovery Themes will provide the basis for the



available on our website at <http://go.osu.edu/jAs>.

recruitment of 500 new tenure-track faculty at Ohio State, both as individual scholars and as teams of faculty in critical areas.

The department will emphasize the development and leadership of proposals in the Discovery Theme competitions, including partnerships with other departments and colleges, to create transformational "big ideas" in the research areas proposed.

We continue to make progress toward these goals, and this plan will help us keep them firmly in our sights.

We will enrich. Improve. Promote. Grow.

We encourage you to take a more in-depth look at our strategic plan,

Johnson appointed ECE department chair

Joel T. Johnson has been selected to serve as the next chair of the Department of Electrical and Computer Engineering.

Johnson is a professor in ECE and at the ElectroScience Laboratory. He joined the department in 1996. His research interests are in the areas of microwave remote sensing, radar systems, propagation, and electromagnetic wave theory.

He has been the principal and/or co-investigator on numerous research projects, including projects sponsored by the Office of Naval Research, the Air Force Office of Scientific Research, the National Science Foundation, and NASA.

He currently serves on the Science Team of NASA's Soil Moisture Active/Passive (SMAP) and Cyclone Global Navigation Satellite System (CYGNSS) missions. He has authored and co-authored more than 95 journal articles and book chapters, as well as 225 conference papers and abstracts in these areas.



Joel T. Johnson
ECE Chair

Johnson was named an IEEE Fellow in 2008. His awards have included the Stanley E. Harrison Award for Excellence in Engineering Education from the College of Engineering in 2006, the Booker Fellowship from the U.S. National Committee of International Union of Radio Science in 2002, the National Science Foundation CAREER Award in 1997, and the Presidential Early Career Award for Scientists and Engineers in 1997.

He served as chair of the IEEE GRS Society's Frequency Allocation for Remote Sensing Technical Committee from 2005-09. He has served on URSI Commission B Technical Advances Committee since 1999 and is an elected member of the International Union of Radio Science (URSI), Commissions B and F. He has been associate editor of the *IEEE Transactions on Geoscience and Remote Sensing* since 2001 and on the editorial board of *Waves in Random and Complex Media* since 2002.

Johnson received his PhD and MS degrees from Massachusetts Institute of Technology in 1999 and 1993, respectively. He earned his BS in electrical engineering from Georgia Institute of Technology in 1991.



Driven to succeed



Professor Umit Ozguner

Ohio State launches \$4.3M vehicle safety center

Researchers at The Ohio State University hope to save lives and reduce the severity of human injuries in auto accidents by looking closely at what happens in the final seconds before vehicle collisions.

The goal of the university's new Crash Imminent Safety University Transportation Center (UTC) is to increase understanding of technology design and improve the ways humans interact with intelligent, autonomous and semi-autonomous vehicles.

The research will include developing advanced accident simulators, performing extensive modeling, analyzing past accidents and developing autonomous vehicles – all with the goal of making the U.S. transportation system the safest in the world.

The center and its research will be funded by a grant from

the U.S. Department of Transportation. The university received \$1.41 million in 2013 and has requested an additional \$1.5 million for 2014. The award and associated cost sharing total \$4.3 million over the first two years of operation.

Partner universities working with Ohio State on the UTC are Indiana University-Purdue University in Indianapolis; North Carolina A&T State University in Greensboro; University of Massachusetts in Amherst; and the University of Wisconsin in Madison.

“During the last few years the introduction of autonomous cars into human-driven traffic has raised safety concerns about the design of these vehicles and how humans will react to them,” said Umit Ozguner, Ohio State professor of electrical and computer engineering and head of the research center. “Analyzing what happens in a vehicle

in the moments leading up to and during an accident is critical to understanding how to mitigate injuries and fatalities. By studying drivers' actions and how vehicles behave in that short period of time, engineers should be able to design safer vehicles. This research will become even more critical in the years to come as even more advanced vehicles are developed."

A key component of the research will be development of a common, networked driver simulation that will allow researchers to experiment with pre-crash safety through simulated accidents.

"A networked simulation with multiple human drivers gives us a closer approximation to real-world driving situations," said Janet Weisenberger, director of Ohio State's Driving Simulation Laboratory and one of the investigators on the project.

"Because people can be unpredictable, this networked simulation will give us a better way to evaluate human driving behavior and decision-making, and use that information to design the best possible autonomous systems for cars."

Ohio State boasts world-class facilities, from a new driving simulator to the Center for Automotive Research. Collectively, the university's activity and expertise aligns extremely well with the development of autonomous ground vehicles, driver behavior, biomechanics and all automotive safety technologies.

The center also will leverage extensive existing facilities and field experiments being conducted at Ohio State's Transportation Research Center (TRC) with the common, networked driver simulation to create an unprecedented ability to experimentally address pre-crash safety.

The Department of Transportation said this type of research is critical in reducing deaths, injuries and property damage from accidents.

According to Ozguner, "Motor vehicle travel has the highest fatality and injury rates per capita of all modes of transportation. It accounts for nearly 95 percent of transportation-related fatalities and drains more than \$230 billion from the economy each year."

"University transportation centers are key to helping us address today's transportation needs, from environmental sustainability to safety," said U.S. Transportation Secretary Anthony Foxx. "The participating universities are a critical part of our national transportation strategy and to developing a professional workforce with the expertise and knowledge to tackle the challenges of the future."

The award to Ohio State's consortium was part of a \$63 million transportation safety grant package announced from the U.S. Department of Transportation's Research and Innovative Technology Administration (RITA).

The grant package will fund projects at 33 UTCs nationwide. More than 142 applications were submitted to RITA for the grants.

The ECE Alumni Society

The EE/ECE Alumni Society promotes the advancement of the best interests of The Ohio State University Department of Electrical and Computer Engineering by providing fellowship and the furtherance of professional relationships among the alumni, students, faculty, staff and friends of the society. The society also promotes and supports the mission of The Ohio State University Alumni Association, Inc.

Officers (2014-15)

President: Jason Smith ('09)

President-Elect: Ronald J. Koch ('89)

Vice President: Liza Toher Reed ('10)

Secretary: Bradley Clymer ('81/'82)

Treasurer: Vimal Buck ('02)

Board members* (2014-15)

Nitin Bhatt ('89)

Robert Borel ('65)

Victor Brechbill (HKN Student Rep)

Carol Duhigg (CARL)

Haskell (Jac) Fought ('97)

Mike Herman (IEEE Student Rep)

Aaron Joseph ('09)

Robert Lee (ECE Chair)

Tyler Sampson ('09)

Marv White ('69)

** Includes elected, non-elected, and ex-officio members*

Scholarship donations appreciated

Donations to the EE/ECE Alumni Society scholarship funds may be made during Reunion-Homecoming registration or online at www.osu.edu/giving. If you would like to donate to any of our scholarship funds, any amount is appreciated and will count toward your OSUAA sustaining membership requirement for 2015. Ohio undergraduate students, fund #312547; non-Ohio undergraduate students, fund #312548; graduate students who were former OSU ECE undergraduate students, fund #312549.

What does the campaign mean to ECE alumni?

We all remember and appreciate those fall Saturdays at the Shoe, the vibrant campus activity and, yes, those long hours studying for finals! For me the real value of those years was the breadth and depth of an engineering education that provided a sound basis for both a professional and personal life as a proud alumnus.



When I return to campus, I see young adults preparing for a similar path, but with greater challenges. Tuition and living costs are higher, stronger curriculums focus more on technology in the limited available course time, and experienced faculty are retiring at an accelerated pace.

BUT FOR OHIO STATE

ECE alumni can and should help the university and today's students address these significant challenges. The ECE campaign is part of the university's "But For Ohio State" campaign, and our priorities are the same: Place students first, elevate faculty and the academic enterprise, create modern learning environments, embolden the research agenda, and drive high-impact innovation.

Under this broad umbrella of priorities, the ECE Campaign Committee (right) is focusing on organizing to meet some specific critical needs. Scholarship funding is critical to help students finance their educations while minimizing debt and outside work. We are assisting the university development team and ECE department in networking with our broad alumni base to recruit and fund internationally renowned faculty and graduate students, which will enhance students' total educational experience. The committee is fostering the development of more inter-disciplinary initiatives with medicine, business, and other appropriate disciplines that are driving new technologies in the world marketplace. This will broaden the exposure to real world demands requiring multiple skill sets for students and faculty.

Over the next year, the ECE Committee will host regional alumni events in major cities around the U.S., where you will be able to network with other alumni and learn more about these initiatives. For more information or comment, contact me at ececampaign@earthlink.net or Lindsey Margaroli, senior director of development, at margaroli.1@osu.edu.

Best regards, and I hope to see you at one of our events!

Bob Borel
ECE Campaign Committee Chair

ECE Campaign Committee

Rodolfo M. Bellesi

Executive Vice President of Technology and a member of the MB Capital Group Board of Directors
MS Electrical Engineering, The Ohio State University (2000);
BS in Electrical Engineering, Federal University of Paraguay (1997)

Bob Borel

CEO of BeamAlloy Technologies, LLC in Plain City, Ohio

BS and MS in Electrical Engineering, The Ohio State University (1965); MBA, University of Rochester (1974)

Dr. Robert B. Dybdal

Engineer with Communications and Networking Division of the Engineering and Technology Group at the Aerospace Corporation

BS and MS in Electrical Engineering (1964), PhD in Electrical Engineering (1968), The Ohio State University

Dr. Mark T. Frankford

Electrical engineer at Northrop Grumman

BS in Electrical and Computer Engineering (2004), MS in Electrical Engineering (2006), and PhD in Electrical and Computer Engineering (2011), The Ohio State University

Reza Norouzzian

Vice President of Worldwide Sales and Business Development at ClariPhy

BS in Electrical Engineering (1981), The Ohio State University

Liza T. Reed

Proposal Developer for the Great Lakes Energy Institute in Cleveland, Ohio

BS (2006) and MS in Electrical and Computer Engineering (2010), The Ohio State University

Jim Sipes

Retired network engineer from Qwest/CenturyLink

BS (1965) and MS (1966) in Electrical Engineering, The Ohio State University

Dr. Marvin H. White

Professor in the Department of Electrical and Computer Engineering, The Ohio State University

BS in Engineering, Physics and Mathematics/Master of Physics from University of Michigan; PhD in Electrical Engineering (1969), The Ohio State University

Dr. Tamer Ibrahim

Associate professor in the Departments of Radiology and Bioengineering (Swanson School of Engineering) at the University of Pittsburgh

BS in Electrical and Computer Engineering (1996), MS in Electrical Engineering (1998) and PhD in Electrical and Computer Engineering (2003), The Ohio State University



THE OHIO STATE UNIVERSITY

COLLEGE OF ENGINEERING

Department of Electrical and Computer Engineering

205 Drees Laboratories, 2015 Neil Avenue

Columbus, OH 43210-1272

Come home again Oct. 18

Celebrate Reunion-Homecoming Weekend with fellow alums

Join friends in the Department of Electrical and Computer Engineering and the EE/ECE Alumni Society for a pre-game Homecoming Southern BBQ tailgate. The fun starts at 12:30 p.m. on the patio between Knowlton and Hitchcock halls.

Game plus tailgate package

\$105 per package*. Each game/tailgate package includes one ticket to the Ohio State vs Rutgers game plus one ticket to the College of Engineering Reunion-Homecoming pre-game tailgate. Tickets are available when you check in at the pregame tailgate. We cannot mail tickets. A photo ID will be required.

Tailgate only

The cost is \$20 per person without a 2014 paid activity fee or \$15 per person with a paid fee. These prices are for ages 10 and above; children ages 9 and under are admitted free. You may also buy these tickets for \$20, regardless of activity fee status, at the tailgate the day of the event or via the College of Engineering online system at engineering.osu.edu/events/2014/10/alumni-homecoming-tailgate-party

Sponsor current ECE students to attend the tailgate

\$20 per student, regardless of activity fee status.

Questions?

Carol Duhigg, 614-292-7392 or duhigg.2@osu.edu

** A paid \$20 annual EE/ECE Alumni Society Activity Fee is required to be eligible to buy up to two game/tailgate packages. The activity fee is for calendar year 2014 and also counts toward your OSUAA sustaining membership requirement for 2015. 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 received OSU vs Rutgers game tickets through the OSUAA lottery, or any other source, including season ticket holders (whether in your name or your spouse's name) are not eligible.*

Ticket availability

Tickets are available on a first-come, first-served basis beginning on the following registration release dates:

August 13: Registration opens for Reunion years – 1964, 1989, 2004 & 2009

August 20: Registration opens for remaining EE/ECE alumni

Register

Register for the EE/ECE Alumni Society Homecoming-Reunion by calling Ohio State Alumni Association's customer service at (614) 292-2281 or (800) 762-5646. While you are on the phone, the agent will check your eligibility to buy up to two football game/tailgate packages, take your credit card information (Visa, MasterCard, or Discover are accepted) and confirm your registration.