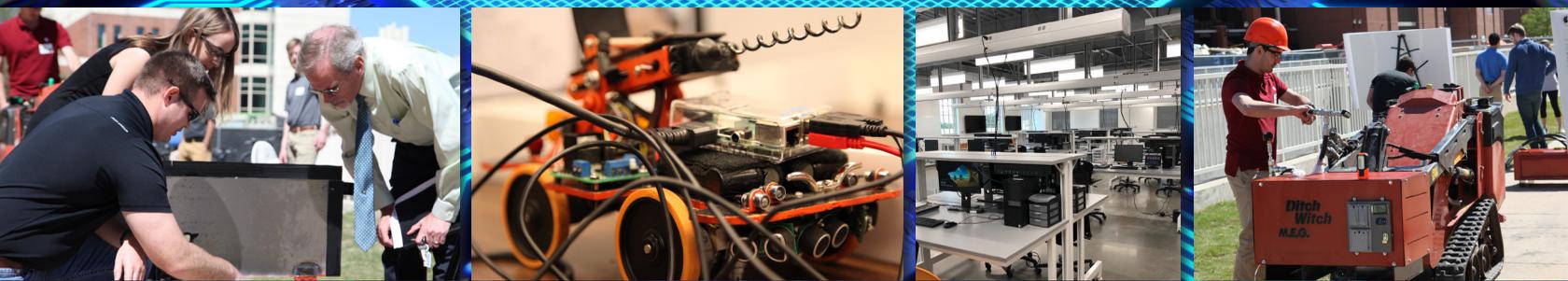


# ECE NETWORKS

## 2018 | ELECTRICAL & COMPUTER ENGINEERING



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## LETTER FROM THE DEPARTMENT HEAD

The School of Electrical and Computer Engineering (ECE) is pleased to offer its most recent edition of ECE Networks, our yearly newsletter that highlights the students, faculty, alumni, events and accomplishments of the School during 2018. As in years before, we have continued our mission to deliver outstanding educational experiences to our students and to generate new and relevant technological knowledge for our state and profession.

A highlight of 2018 was the celebration of the Dean's initiative to build a new undergraduate teaching laboratory, which came to fruition with the opening of ENDEAVOR. This one-of-a-kind, 72,000 square-foot structure houses a wide range of interdisciplinary laboratories that are open to just about any student in the College of Engineering, Architecture and Technology. Of particular importance to ECE are the Measurement and Sensors Lab, the RF/Communications Lab, and the Autonomous Vehicles Lab. These laboratories are equipped with state-of-the-art equipment and instruments that will allow our students ample opportunity to bridge the wide gap between theory and practice. As described in our featured articles, it is not an understatement to say that these laboratories are game-changers for ECE.

Due to the generosity of our alumni and friends, we in ECE have a very generous and robust scholarship program. Over the past couple of years, we directed a large portion of our available scholarship funds to incoming ECE freshmen that were selected to be a part of the Dean's CEAT Scholars program. This program not only encourages high scholastic effort, but it also builds future leaders and provides a wide range of cultural activities. Inside this edition you will learn about Aarushi Singh, Brenden Martin, Ryan Horton, and Olivia Long, all of whom are representative of the excellent students who participate in the CEAT Scholars program.

In addition to featuring our students, we have dedicated some pages of ECE Networks to showcase the research activities of ECE professors James Stine, Yanmin Gong, Sabit Ekin, Ickhyun Song and Wooyeol Choi. These activities span the topics of VLSI application-specific chips, security and privacy, wireless communications, extreme environment electronics and CMOS THz electronics. Of particular note is Dr. Stine's \$1.5M grant from the US Air Force to design low-power, multi-core chips for access/denial, combat-ready environments.

We are very excited to have hired two outstanding assistant professors, Drs. Ickhyun Song and Wooyeol Choi, both of whom are subject matter experts in high-frequency electronics. Dr. Song graduated from the Georgia Institute of Technology; he specializes in extreme-environment electronics radiation effects and hardening techniques, cryogenic applications, wideband RF/millimeter-wave systems, and high-speed analog integrated circuits. Dr. Choi has expertise in RF-to-THz integrated circuit design, THz systems for imaging, spectroscopy and communication, microwave device characterization and modeling, and nonlinear microwave circuit theory; he comes to us from the University of Texas, Dallas, where he served as a research

associate for several years. Both Drs. Song and Choi have hit the ground running in revamping our electronics curriculum and rebuilding our electronics research laboratories. The School has made substantial investments in their laboratories as part of our DC-to-light strategy in the broad area of communication systems.

During 2018, Drs. Chris Hutchens, Subhash Kak and Rama Ramakumar announced their retirements. These fine scholars and educators have given about 100 years of combined, dedicated service to the School and to OSU. Their positive impact on our students is unquestioned. Additionally, Ms. Helen Daggs, ECE's academic adviser, also announced her retirement at the end of 2018. She has faithfully counseled and nurtured our students for the past 16 years. We offer our warmest well wishes to Chris, Subhash, Rama and Helen as they embark on the next phase of their professional and personal lives.

Our newsletter would be incomplete if we failed to honor and highlight the accomplishments of our alumni. Many of these alumni give back to ECE by participating on the ECE Industrial Advisory Board. Wes Ray (president), Bryan Burns, Greg Smith and Todd Hiemer are examples of such alumni and are featured herein. Featured with them are recent graduates like Lee Easton (2014) and senior alumni like Dr. Craig Stunkel (1982). These alumni exemplify living proof of how their education at OSU transformed their lives and prepared them for a rewarding career in electrical and computer engineering. Learn more about these fine individuals in the following pages.

This past year was another robust year for financial gifts to our programs. I am ever so thankful to ECE's alumni and friends who faithfully give back to ECE. We recently received a planned, estate gift valued at \$2M. Interest payments off of this gift will be used to fund our building infrastructure programs, the modernization of our laboratories, student activities and scholarships. To the giver of this gift (who requested anonymity), thank you! More than that, thank you to all of our donors. Without your support, we would certainly find it difficult to execute our mission and to assist our students with the finances of their education. We pledge to use your money both wisely and effectively.

In closing, I wish to express my heartfelt thankfulness to the ECE Publicity Committee, who spends countless hours each year to publish ECE Networks and to sponsor the ECE Distinguished Seminar series.



Sincerely,  
Jeffrey L. Young  
ECE Professor and Head

P.S. Your financial gifts to support our programs and students are always deeply appreciated. Please turn to the back cover of ECE Networks to learn more about giving opportunities.

## IEEE Student Branch at OSU Bridges Classroom Classics with Field Fun



The Zeeco, Inc. staff members, one of which graduated from ECE of OSU, are pictured standing with the blackboard in the background. Two IEEE-OSU officers, (right hand side) are Ian Gibson, President (left) and Emily King, Secretary (right). Students are seen lining up at the left hand side for pizza delivered hot. –Photograph taken by Faculty Advisor, ECE Professor Dr. Daqing (Daching) Piao, in Engineering South 412.

The OSU Student Branch of the Institute of Electrical and Electronic Engineering (IEEE) is a vibrant organization affiliated with the School of Electrical and Computer Engineering. Open to all students of the School, the Branch provides many valuable services and networking opportunities.

Each month of a semester the students host representatives from local and regional companies to share experiences and stories about engineering life in the “real world.” They learn that engineering is more than mathematical equations and computer simulations. They also learn about team work, customer demands, business models, design cycles, and last minute efforts to meet a scheduled delivery. The goal is to enlarge students’ understanding of the scope of engineering and to expose them to the many and various career opportunities of the profession.

At the Sept. 12, 2018 meeting, the students heard a fascinating presentation entitled “Field Fun” by three engineering staff members from Zeeco, Inc., Broken Arrow, Okla. These members spoke about how projects had to be fixed on the spot and in the field. According to Prof. Daqing Piao, IEEE faculty adviser and ECE professor, “Their humongous industrial incinerator was pretty interesting, and the control and thermal dynamics associated with the incinerator were something students asked about. This meeting had a large turn-out.”

The Student Branch also serves as a first contact and introduction to IEEE, the world’s largest technical and professional organization with over 420,000 members. IEEE is a one-stop-shop for almost anything that will touch their professional career by publishing research results, setting technical standards, sponsoring conferences and workshops, providing career assistance, and reviewing new trends in the profession.

However, the Branch is more than that. Its other main purpose is to bring students and faculty together for informal discussions and socials. Each year the Branch hosts a fall picnic and a spring awards banquet.

Membership is quite affordable and worth it; free pizza is served at each meeting. And given that it is pizza and it is free, the turnout is never disappointing. ■

The following ECE students are the officers of OSU IEEE Student Branch for the current 2018-2019 academic year:

<b>President</b>	Ian Gibson
<b>Vice President</b>	John Ondiek
<b>Secretary</b>	Emily King
<b>Treasurer</b>	Gage Greenhouse
<b>Professional Relations Director</b>	Ian Gibson
<b>Social Director</b>	Ryan Swann
<b>Publicity Director</b>	Kelvin Lew
<b>CEAT Representative</b>	Omar Alchami

# STUDENTS & FACULTY

## ECE Student Scholars

The School of Electrical and Computer Engineering is proud of **Ryan Horton, Olivia Long, Brenden Martin** and **Lauren Brown**, all of whom are designated as CEAT ECE Scholars. The CEAT Scholars program provides \$15,000 in financial support to each scholar. The program engages mentors, creates global awareness, and develops leaders through a unique set of enrichment activities in the categories of cultural experiences, professional development, industry tours and community service. In addition to these experiences, students in the CEAT Scholars program participate in summer tours in the United States and abroad.



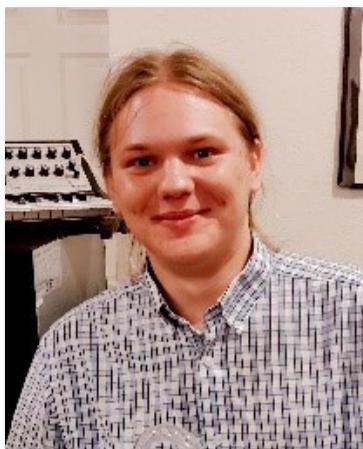
### Ryan Horton

“As a member of the CEAT Scholars program I have been blessed to attend a variety of fun and interesting events such as seeing the musical ‘The Book of Mormon’, going on several different industry tours, and also attending a variety of talks given by professionals in their respective fields. Being able to surround myself with my peers and fellow CEAT Scholars, I have been able to improve myself as both a student and as a person. I cannot wait to see what the future holds for us all and am eager to continue my education alongside them at Oklahoma State University. As a sophomore in college I still have a long way to go on my educational journey, but I believe that the CEAT Scholars program will have a great impact on my future as I pursue a career in engineering.”



### Olivia Long

“CEAT Scholars is an amazing scholarship program with access to many benefits, such as professional development, international experiences and community service. However, I would say that the best part of the CEAT Scholars program would simply be the social connections we are able to make here at Oklahoma State University. After a year of socializing with my fellow CEAT Scholars, I have been pleasantly surprised by how broad the passions are among CEAT Scholars. Some are interested in virtual reality; others are interested in 3D printing of human organs. Many of us will eventually be leading the STEM community. And yet, I am able to bond with these leaders now. Having this opportunity to watch and grow with my fellow students is a gift within itself. If we can learn to work together now, we will accomplish amazing feats in years to come.”



### Brenden Martin

“Being in the CEAT Scholars program is an enjoyable experience as well as a productive one. The program provides the chance to attend events both at home and abroad, which I definitely would not have the spare cash for otherwise! The program has already opened up tremendous opportunities for me through the introduction to faculty members. These professors led me to my involvement with research, which has in turn led to a job in the Ultrafast Terahertz Optoelectronics Laboratory. The Scholars program is a source of fun and opportunity for which I am truly grateful. Accordingly, I would like to extend my grandest thanks to the donors that fund us and to the professors who inspire us. Rest assured, we’re doing our best to make sure both the money and time you’ve invested in us is well spent!”

Aarushi Singh was chosen as one of the W.W. Allen Scholars for the 2018-2019 school year. This premier CEAT scholarship provides scholarships, enrichment activities, and study-abroad experiences for a select group of students each year. Singh, along with the other Allen scholars, will receive academic support to participate in a one-year Masters of Philosophy program at the University of Cambridge in the United Kingdom immediately following graduation.



### Aarushi Singh

"I was so excited and surprised when I got the call that I was selected to be one of the 2018-2019 W.W. Allen Scholars! This scholarship will strengthen my academic, leadership, and social skills, and I'm grateful to be mentored by some of the top engineering faculty members that OSU has to offer. I am excited for the opportunity to visit countries with other CEAT scholars and also to pursue a master's degree from Cambridge University. I am thankful for this opportunity and I look forward to working with other peers who have similar goals and aspirations as me. In the future, I want to pursue a career in cutting-edge science, technology, and innovation, and want roles that involve leading teams, defining strategy and serving as an industry leader. With a computer engineering degree, I want to first work for innovative companies such as Google or Amazon, and then eventually, I wish to establish my own high-tech startup that utilizes computer engineering and artificial intelligence to address problems that will face humanity in the 21st century, such as climate change, access to health care, energy independence and clean water."

### Orange Robe Recipient



### Sam Lovell

ECE is proud of Sam Lovell, Orange Robe recipient for CEAT during the 2017 Fall Commencement. The Orange Robe recipient is distinguished amongst all other graduates by wearing an orange robe and by being the standard bearer for their college during the processional and recessional. Sam's award is another testament of ECE students being selected and honored by CEAT for their high academic accomplishments and leadership credentials.

### Faculty and Staff Retirements



The School offers its warmest well wishes to **Ms. Helen Daggs** and **Drs. Chris Hutchens, Subhash Kak, and Rama Ramakumar**, all of whom have announced their retirement plans in 2018 after a very successful and productive career at OSU. Each one of them have left a positive and long lasting impact on their colleagues and students. We particularly wish to acknowledge Ms. Daggs' 16 years, Dr. Hutchens' 33 years, Dr. Kak's 9 years and Dr. Ramakumar's 52 years of continuous service to ECE. These 110 years of combined experience and service corroborates our assertion that ECE faculty and staff are 100 percent dedicated to the ECE mission of teaching, research and service.

# STUDENTS & FACULTY

## ECE Students Study Abroad in Japan

By Kylie Moulton

In 2007, Keith Teague took his first trip to Asia. Teague visited industries and political groups in Vietnam discussing economic development and education. This was an eye opening experience for Teague and he was hooked.

Teague, professor in the School of Electrical and Computer Engineering at OSU, now leads study abroad trips each year to Japan.

“People in different parts of the world deal with being engineers in different ways,” Teague said. “So there are differences in the way they practice engineering and in the way products are designed and manufactured. There are cultural differences too. In Japan so much focus is on the community as opposed to the individual. If you go to another country they have different social, political and cultural needs than we do here.

“I think it’s very important for students to see there’s more to the world than just us.”

Nick Overacker was one student that took advantage of the opportunity to study abroad during his college career. Overacker graduated in fall 2018 with a degree in electrical and computer engineering from OSU. Curiosity is what brought Overacker to ECE and also what led him to a minor in Japanese.

“As with electronics, I felt there was this huge part of the world around me that I didn’t understand and I wanted to learn what the secrets were to that,”

Overacker said. “When I started studying Japanese, I actually didn’t know anything about the culture. During my second year of studying the language, I became involved in the Japanese Student Association. Through that experience I made a lot of Japanese friends and got very close to a lot of them. OSU has usually fewer than 20 Japanese students on campus at one time. So I was able to get to know all of them. It made me very interested in going to Japan.”

In 2016, Overacker did just that. He traveled to Japan where he spent 13 months as an exchange student.

“The way people interact with each other and with their environment, and generally every aspect of their life in Japan is just very different than in the United States,” Overacker said. “It gave me a completely new outlook and showed me a different way to live life. I gained marketable language skills and gained insight on ways to live life. I don’t have to just follow what’s prescribed for me here. I can choose the best of everything I know. And I feel I gained some insight on different markets, and the way people interact with products and technology in other countries.”

To current students thinking about studying abroad, Overacker says, “definitely do it.”

“It’s going to be easier as a student than afterward. You won’t have a summer break or a year to take off for something like that after graduating,” Overacker said. “There’s a lot of funding available that most people don’t realize. People often say ‘I want to study abroad but I can’t afford it.’ I was someone that couldn’t afford to go to school in the first place. I came to school on the funding available and I went abroad on much more funding than was available. Before I went to Japan, I applied for several study abroad scholarships, some at OSU and some outside. I recommend everyone apply to as many scholarships as they can. I ended up going with \$30,000 in funding.”

Since graduating, Overacker accepted a position at Wavetech, LLC in Stillwater. Wavetech was founded in 2011 by Dr. John O’Hara, assistant professor in ECE. The company is active in cutting-edge research while simultaneously providing practical, customer-oriented services in engineering. Dr. O’Hara recruited Overacker at a robotics event on campus.



Past students of Kansai Gaidai University in Osaka, Japan, that also studied at OSU, are pictured with Nick Overacker (second from the right).



Himeji Castle in Himeji, Japan is considered the best remaining example of Japanese castle architecture. CEAT Japan study abroad students visited and explored the castle.

Another student that took advantage of the study abroad opportunity during their college career was Samer Elkhalid. Elkhalid graduated in May 2018 with his bachelor's in electrical and computer engineering. He has always been fascinated with digital devices, especially computers. Growing up watching anime and playing video games, Elkhalid has also had a fascination with Japanese culture. He was able to fulfill his dream of visiting Japan on a study abroad trip with Dr. Teague and Dr. Norb Delatte in May 2017.

"I loved every bit of it! We got to go sightseeing on many cultural tours seeing castles, shrines and temples," Elkhalid said. "We went on various business tours including a trip to Sony World Headquarters in Tokyo, which was my personal favorite business trip. And we got to have some time to ourselves exploring the various cities we went to like Tokyo, Osaka, Negoya and Hiroshima."

This experience changed Elkhalid's education back in the United States.

"I definitely have a wider perspective of how a different cultures operate," said Elkhalid. "Learning about the importance of team work can go a long way. One big thing that I noticed about the Japanese while



CEAT Japan study abroad students, Dr. Norb Delatte (top row, second), OSU alumnus Tom Loafmann (far left) and several Japanese students are pictured at the top of a long climb beneath Kiyomizudera Temple or "Pure Water Temple" in Kyoto, Japan.

## STUDENTS & FACULTY

I was there is that they are very efficient and hard working. They are a very homogeneous society and every individual does what they can to be a productive member of the society. After my trip, I felt more willing to give help and be more of a volunteer to my senior design partners, and at the same time, be willing to receive help from them.”

Since graduating from OSU, Elkhaid accepted a job as a software engineer at Epiroc Drilling Solutions.

“Going on this trip was like a dream come true!”

Teague has spent many years building relationships with contacts in Asia to make the study abroad trips educational as well as fun. The itinerary includes tours of Mitsubishi Heavy Industries, Takenaka R&D Institute and Toyota, as well as cultural visits to Hiroshima, Miyajima Island and Kyoto.

“I think they’re tremendous experiences and I think there are a lot of students that don’t realize what they’re missing,” Teague said. “If we can help convince them that this is the sort of thing they ought to try at least once in their life, I think many of them would get something out of it they may not even know they’re missing.” ■



The CEAT Japan study abroad students, Dr. Norb Delatte (left) and Dr. Keith Teague (far right) along with several Japanese students visited the Kiyomizudera Temple, meaning “Pure Water Temple”, in Kyoto, Japan.



OSU students studying at Shinshu University (from left to right). Jordan Sexton, Tyler Mayberry, Nick Overacker and Darian Shay are pictured at Station 7 on Mount Fuji. The students stayed there after an arduous climb and watched the sun rise in the morning.



ECE alumnus Samer Elkhaid is pictured in front of Kinkakuji, or “The Golden Temple”, in Kyoto, Japan.



Nick Overacker enjoys the countryside surrounding Azumino, a rural town that produces most of Japan's wasabi.

## New ECE Laboratories in ENDEAVOR

The School of Electrical and Computer Engineering is proud to announce three new ECE undergraduate laboratories in ENDEAVOR, CEAT's new, state-of-the-art undergraduate laboratory building. These labs allow us to greatly enhance the learning experience for all ECE undergraduate students by bridging theory with hands-on learning experiences.



### Measurement and Sensors Laboratory

The Measurement and Sensors Laboratory serves the purpose of offering students hands-on experiences in digital system design, computer systems, computer architecture and networking. Located in room 360 of ENDEAVOR, this lab is equipped with desktop computers, National Instruments Elvis III+WiFi boards, FPGA+microprocessor devices, ARM-based processor boards, networking facilities and large monitors, all of which provide a state-of-the-art teaching and learning environment.

Currently, the School of Electrical and Computer Engineering is using this lab to augment the

instruction in Computer Based Systems (ENSC 3213), Digital Logic Design (ECEN 3233), and Computer Architecture (ECEN 4283). A laboratory for Computer Networking (ECEN 4283) is envisioned for the future. Students in these classes learn the concepts and skills of designing and implementing digital and computing systems that involve microprocessors and their interaction with outside systems (e.g., networking). Advanced topics include computer graphics, multiprocessors, bus interface management and Internet of Things. Students work in a team environment, tackle difficult tasks and learn from each other. ■



*“The Measurement and Sensor Laboratory in ENDEAVOR is a tremendous opportunity for our computer engineering students. It will provide quality facilities allowing our students to study cutting-edge technology as well as learn the most challenging and current topics addressed by industry. Our students are the best and we work hard to help them succeed in every possible way. With ENDEAVOR, this creates new possibilities with the projects and assignments they can study. We are not only excited by our students’ work, especially now with ENDEAVOR’s possibilities, but for the problems they can solve on their way to success.”*

*- James Stine, Professor*

# STUDENTS & FACULTY

## RF/Communications Laboratory

The School of Electrical and Computer Engineering is proud to announce the new RF/Communications Laboratory, ENDEAVOR, room 350. The lab is equipped with brand new, state-of-the-art measurement and testing instruments such as handheld microwave analyzers, software defined radios (SDR), signal generators, oscilloscopes, and National Instrument ELVIS II+ and III prototyping and communication platforms. The lab is designed to cover a broad range of topics in the areas of microwave circuits, communication systems and antennas by integrating lab modules and class projects for both undergraduate and graduate courses. The RF/Com lab will also provide student resources and opportunities for projects in different courses such as senior design, and even hobby projects. A hands-on teaching approach will help students overcome the barriers to understanding difficult topics like power loss, occupied bandwidth, radio transceiver principles, software defined radio technologies, and analog and digital modulation methods. The lab will also be a springboard for students to improve their skills (and resume) by participating in the Keysight RF & Microwave Industry-Ready Student Certification Program.

Through the generous support of our industrial partner, Keysight Technologies, and the sizable investment from CEAT, ECE students now have the chance to learn advanced, hands-on experimental methods in RF and microwave technologies. Only a few universities within the US have this kind of teaching platform. Students leaving this laboratory will be ready for their first entry-level job in the fast-paced communications industry.

Some of the key components of the lab are:

- **14GHz Handheld FieldFox RF and Microwave Analyzers**, which operate as either a spectrum analyzer or a 2-port vector network analyzer. This versatile tool will give students hands-on experiences with professional-grade equipment and teach signal measurement techniques and analysis methods relevant to all high-frequency technologies.
- **NI ELVIS** is a platform for teaching many different engineering classes. It has broad measurement and instrumentation capabilities, and comes with software that enables it to function as different instruments, such as an oscilloscope, function generator, or multi-meter. NI ELVIS with DATEX (and FOTEx) boards and NI-USRP will be used for teaching the fundamentals of communications.
- **NI Universal Software Radio Peripheral**, also referred to as SDR, provides a powerful and flexible platform for learning about communication systems, software defined radio and cognitive radios. ■



ECE seniors conducting a lab experiment on AM (amplitude modulation) radio as part of ECE's Data Communications course.



*"We believe that the best way to create capable engineers of tomorrow is to provide students hands-on lab classes reinforcing theoretical concepts as they are taught. Experiential learning can create a path for students to naturally bridge from education to engineering practice. The state-of-the-art equipment that we put in this lab is great for teaching the core concepts of communications, radio-frequency waves and antenna systems." - Sabit Ekin, Assistant Professor*

# Autonomous Vehicles Laboratory

The Autonomous Vehicles Laboratory offers students hands-on experiences in robotics, embedded systems and mechatronics. Located in room 170 of ENDEAVOR, this lab is equipped with desktop computers, mobile robots, embedded computing devices, networking facilities and large monitors that provide a state-of-the-art teaching and learning environment.

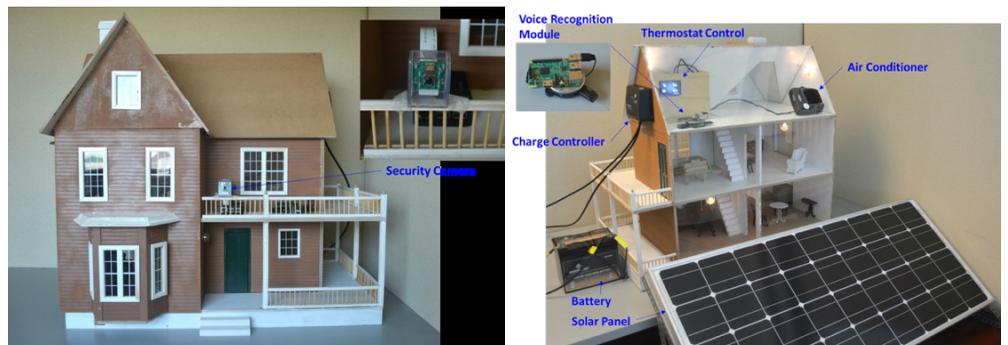
Currently, the School of Electrical and Computer Engineering is using this room for the lab instruction of ECEN4213, Embedded Computer Systems Design. Students in this class learn the concepts and skills of designing and implementing embedded systems that involve microcontrollers. Advanced topics, including cloud computing and Internet of Things (IoT), are also covered. The laboratory component consists of five modules that cover the topics of 1) basic input/output and ADC/DAC, 2) interrupts and timers, 3) remote control of a mobile robot through wireless communication, 4) autonomous navigation of a mobile robot using onboard sensors, 5) web-based control of a mini-smart home. The lab equipment includes Intel Galileo single board computers, Kobuki robots, a cloud server and a custom-designed mini-smart home that features a smart phone controlled air conditioning and lighting system. Students conduct the labs in a team environment and each lab module lasts about two or three weeks. ■



Students working on their laboratory assignments in the Autonomous Vehicles Lab



The Intel Galileo and Kobuki Robot

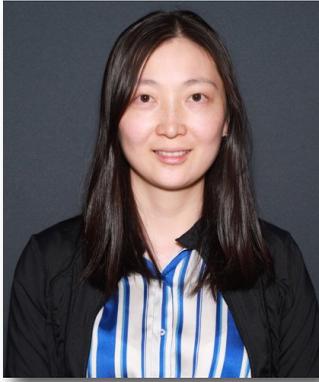


The mini-smart Home



*"With this Autonomous Vehicles Lab and the equipment in it, undergraduate students in the ECE program get the opportunities to enhance their classroom learning with hands-on experiments in various topics related to embedded computer systems, including robotics, networking, cloud computing and Internet of Things. This new lab has greatly boosted our capabilities in teaching these topics and our students are certainly benefiting from it." - Weihua Sheng, Associate Professor*

## RESEARCH HIGHLIGHTS



### Network and Information Security and Privacy

Dr. Yanmin Gong

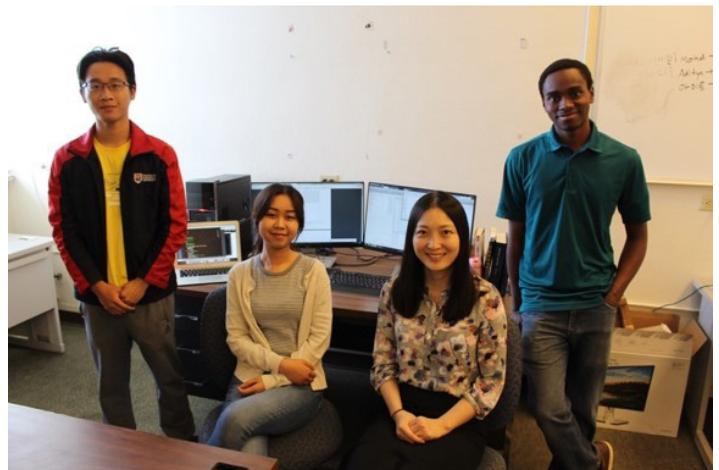
*Think twice before you share: protecting user privacy for big data applications*

Dr. Yanmin Gong's current research interests include security and privacy in mobile, wireless and cyberphysical systems. Advances in computing and electronic communication technologies have enabled ubiquitous collection of high volume, high velocity, and/or a variety information assets, leading to the era of big data. Big data have driven innovation, productivity, efficiency and growth in many domains, creating enormous benefits for the global economy. However, with massive data and advanced data analytical techniques, far more information can be compromised than most people have anticipated at the time of data collection and publication, as evidenced by recent privacy leakage incidents, such as the AOL search log scandal and the de-anonymization of Netflix prize data. The power of big data also motivates ubiquitous interconnectivity of physical systems that are previously unconnected, which brings about security challenges that do not exist for isolated systems.

Dr. Gong's research group in the Network and Information Security and Privacy Laboratory focuses on searching for privacy-preserving solutions that both allow people to learn information as it was intended and stop people from learning information in ways it was not. Her group especially focuses on data-driven approaches for wireless communication, mobile systems, and provides solutions that enable these systems to utilize data while preserving user privacy. The work by her research group on privacy-preserving, data-driven dynamic spectrum access and securing cyber-physical systems through proactive

defense has been published in top publishing journals and conference proceedings. The group is also working on designing novel solutions to secure communication in wireless mesh networks and mobile computing, secure vehicle-to-vehicle communication, and robust decision against data pollution attacks for autonomous vehicles.

Professor Gong joined the School of Electrical and Computer Engineering at Oklahoma State University as an assistant professor in August 2016. She received her Ph.D. from the Department of Electrical and Computer Engineering at the University of Florida in 2016, her M.S. in information and communication engineering at Tsinghua University, Beijing, China, in 2012, and her B.E. in electronics and information engineering at Huazhong University of Science and Technology, Wuhan, China, in 2009. ■



From left to right, Zonghao Huang, Rui Hu, Dr. Gong and Dommic Eaton.



## Wireless Communication and Sensing Research

Dr. Sabit Ekin

*Wireless sensors and modern communications*

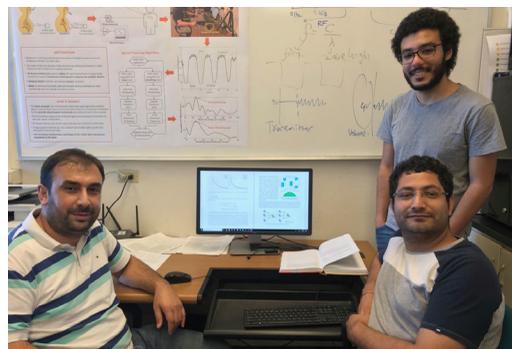
Professor Sabit Ekin and his group are working on several projects related to wireless communication and sensing.

### CubeSats:

Satellites the size of a loaf of bread are currently orbiting the Earth. These small satellites, or CubeSats, are a revolutionary, cost effective way for educational institutions and commercial companies to conduct research. But with increases in their use come new problems with communication links. Professor Ekin has been tasked with finding the solution. He is working with NASA to improve the radio frequency communication links of small satellites. The research project will support optimized, efficient and reliable communication links for NASA science and human space exploration missions. His research is funded by a NASA EPSCoR Research Initiation Grant. Multiple disciplines will be impacted by Ekin's research including space science, astronomy, earth science, and mechanical and aerospace engineering, as they all collect data from space that need to be sent back to earth.

### ViLDAR:

With the introduction of autonomous and connected vehicles into the market, technology must adapt. These vehicles must be able to sense and communicate with their surroundings and other vehicles. Dr. Ekin's collaborative project with Dr. Ahmed Samir (School of Civil and Environmental Engineering), entitled "Visible Light Sensing Based Vehicle Speed Estimation and Vehicular



Dr. Sabit Ekin (left) and his graduate students working on CubeSat project: Amit Kachroo (right, sitting) and Hisham Abuella (right, standing).



Dr. Sabit Ekin (right, sitting), Dr. Ryan Reuters (Associate Professor of Animal Science, standing), associate professor of animal science, and graduate students Hussein Kwasmeh (left, sitting) and Hisham Abuella (middle, sitting) working on Livestock Monitoring via Internet of Things project.

Communication", utilize a vehicle's headlamps for speed detection and communication purposes, which is known as Visible Light Detection And Ranging (ViLDAR). This project is funded by the US Department of Transportation through Louisiana State University.

### Livestock Monitoring via Internet of Things:

Dr. Ekin leads an interdisciplinary research project, entitled "Livestock Monitoring via Environment Powered Internet of Things". The team members are from animal sciences, biosystems and agricultural engineering, and the business school. The project's objective is to develop an integrated livestock monitoring system; it can be thought of as Fitbits for cows. Their project won first place in the prestigious 2017 OSU President's Cup for Creative Interdisciplinary Research.

Dr. Ekin joined the School of Electrical and Computer Engineering as an assistant professor in fall 2016. He has four years of industrial experience from Qualcomm, Inc. as a Senior Modem Systems Engineer at the Department of Qualcomm Mobile Computing. He received his Ph.D. in electrical and computer engineering from Texas A&M University in 2012, his M.Sc. in electrical engineering from New Mexico Tech in 2008, and his B.Sc. in electrical and electronics engineering from Eskisehir Osmangazi University, Turkey, in 2006. ■

# RESEARCH HIGHLIGHTS



## Tackling the Golden Age of Computer Architectures for Application-Specific VLSI

Dr. James Stine

*Architectures and systems: empowering new frontiers*

Professor James Stine is working with the United States Air Force and the Department of Defense (DOD) to improve architectures for processing large amounts of signals and securing communications. He has received a \$1.5M research grant awarded by the Air Force Research Laboratory (AFRL) and the DOD to conduct this research of national importance.

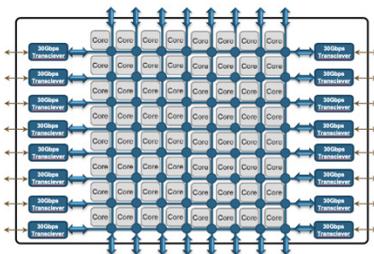
The award is part of the Air Force's Future Autonomous Battlespace RF w/Integrated Communications Project, which is a transformative communication program appropriate for access/area denial environments. The overall goal is to provide combat-ready, cyber-hardened, power efficient, embedded computer architectures.

The scope of his research is targeted at the implementation of signal processing and multi-core architectures that exhibit low power at small feature sizes (i.e., 45nm, 32nm, 14nm, 7nm). Nowadays, applications, especially real-time systems, require significant computational power to process more data in one unit of time. While the need for heavy computation exists, the demand for computer architectures that consume smaller amounts of energy is also paramount. This is complicated by the fact that energy and power performance is related to the number of devices on a chip and its respective application. Consequently, the dichotomy of

adding more devices, yet maintaining lower energy footprints, is complicated by the fact that both are inversely proportional to each other. Therefore, low power and high performance are always among the top priorities in designing almost all Very Large-Scale Integration (VLSI) systems. Dr. Stine's project aims to target this problem and achieve solutions that have been previously unsolvable using pre-existing techniques.

Dr. Stine is an expert in system-on-a-chip design flow and the leading manufacturers of electronic design automatic (EDA) software (e.g., Cadence Design Systems, Synopsys, and Mentor Graphics) have or currently use his tools. Moreover, MOSIS (mosis.com), which provides chip design tools and related services for universities, government agencies, research institutes and businesses to prototype chips efficiently and cost-effectively, use his tools.

Dr. Stine is the Earl and Carolyn Glimp Professor in the School of Electrical and Computer Engineering. He received his Ph.D. in electrical and computer engineering from Lehigh University in 2000. ■



64-core chip with high throughput on-chip network with peak performance of 3.0 HP TFLOPS and 10 W of power consumption



VLSI Computer Architecture Research Laboratory



Cascade Microtech EPS150 Probe Station



VLSI Computer Architecture Chip Testing Infrastructure



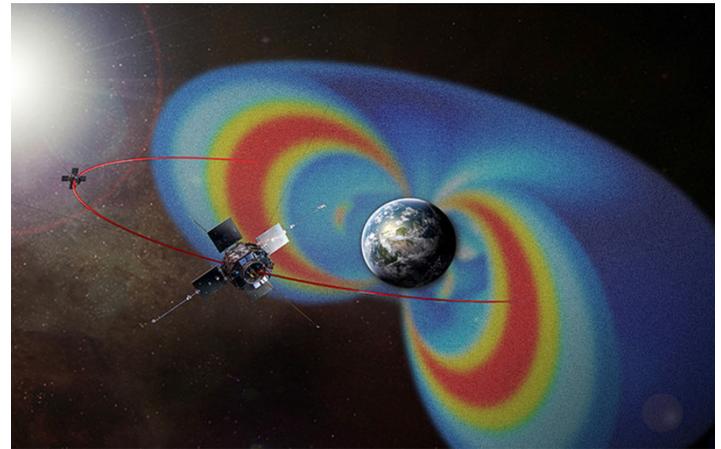
## Extreme-Environment Electronics

Dr. Ickhyun Song

*Enabling technology for next-generation space applications*

Dr. Ickhyun Song and his research team focus on the design of extreme-environment electronics and wideband radio frequency (RF) integrated circuits.

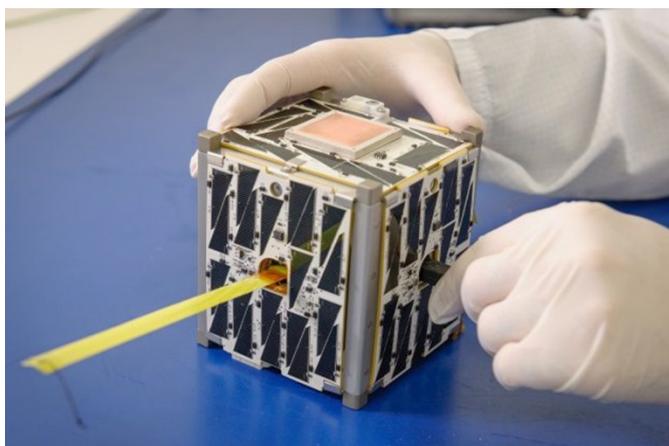
Extreme-environment electronics are typically required to operate under severe operational constraints (radiation effects and cryogenic conditions) to their constituent devices. For example, in space, satellites are exposed to strong ambient radiation, and thus, their lifetime is considerably shorter than ordinary commercial electronics. To alleviate the impact of the extreme environment, engineers have conventionally utilized heavy, bulky shielding structures, which inevitably increase complexity and development cost. Within this context, Dr. Song has worked on circuit-level radiation-hardening techniques to provide reliable performance under harsh conditions, such as intense radiation and extreme temperatures. He has proposed new design techniques that minimize unwanted transients generated during heavy-ion strike for a variety of RF components. Dr. Song has also designed high-performance wideband RF circuits and systems. One of his recent designs is a wideband, low-loss compact digital step attenuator, which is suitable for a large-scale phased array, such as radar and communications systems.



An illustration of space radiation environment  
*Image courtesy of Los Alamos National Laboratory*

His research at Oklahoma State University will extend his previous work to the following topics: design of radiation-hardened transmitters and receivers using various device/circuit/system level techniques (e.g., electrostatic discharge circuitry and device profile optimization), cryogenic analog/RF electronics, and high-performance wideband systems (e.g., 5G communications and vehicle-to-vehicle networks). In carrying out these research items, collaboration with national laboratories, research institutes and leading industries will be initiated and promoted.

Dr. Song joined the School of Electrical and Computer Engineering in fall 2018. He received his B.S. and M.S. degrees in electrical engineering from Seoul National University, Korea, in 2006 and 2008, respectively, and his Ph.D. degree in electrical and computer engineering from Georgia Institute of Technology, Atlanta, Ga. in 2016. From 2008 to 2012, he was a design engineer at Samsung Electronics Company, Korea, where he contributed to the development of next-generation memory products. Prior to joining OSU, he was a member of the School of Electrical and Computer Engineering, Georgia Institute of Technology, as a research engineer. ■



A picture of a cubeSat (small-sized satellite)  
*Image courtesy of NASA/Ames Research Center*

# RESEARCH HIGHLIGHTS



## Affordable THz Electronics using CMOS Technology

**Dr. Wooyeol Choi**

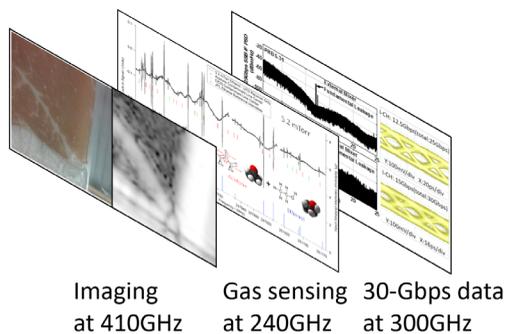
*Seeing through obstacles, sensing gases, sending high-speed data*

Dr. Wooyeol Choi is currently working with Texas Instruments to develop integrated circuits and systems for imaging at 410 GHz. Texas Instrument is supporting his research through their Foundational Technology Research Center program.

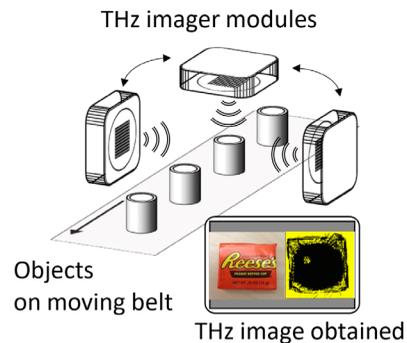
Use of higher frequency makes higher resolution imaging possible for the same physical size. 410 GHz systems can support 5.3 times better resolution than 77 GHz systems with same-sized antennas. Also, since 410 GHz lies within the “propagation window”, where the amount of signal lost in the atmosphere is relatively low, imaging at 5 to 10m distances with less than 1 degree resolution should be possible in a handheld formfactor. Another important aspect of the project is that the generation and detection of such high frequency signals will be performed using CMOS technologies, which offers low cost, high yield and large volume manufacturing. If successful, compact 410 GHz imagers will be demonstrated for industrial applications. The imager and the foundational technologies developed should be able to find more applications in various fields including high resolution and low cost radars for autonomous cars, gesture recognition and biomedical monitoring at distance.

Dr. Choi’s research focuses on high frequency electronics for RF-to-THz applications. He has designed and demonstrated integrated circuits (IC) and systems operating from a few GHz to several hundred GHz using silicon and compound semiconductor technologies. His recent research focuses on the use of the frequency spectrum that ranges from 100 GHz to a few THz for everyday applications, such as high speed wired/wireless communications, high resolution active imaging, and gas sensing with absolute specificity. By combining the unique characteristics of THz waves and the techniques to build affordable high frequency electronics, he is striving to accelerate the adoption of such technologies in everyday life. High frequency electronics can be applied to many different parts of an electronic system. High speed digital systems, quantum computing hardware and wireless power transfer can benefit from the knowledge and techniques obtained from Dr. Choi's research.

Dr. Choi joined the School of Electrical and Computer Engineering as an assistant professor in the fall of 2018. He was with the University of Texas in Dallas, Texas for seven years, first as a research associate and later as an assistant research professor. He received his Ph.D. and M.S. in electrical engineering from Seoul National University, Seoul, Korea, and his B.S. in electronic engineering from Yonsei University, Seoul, Korea. ■



**Applications of THz wave; imaging, gas sensing; communication**



**410-GHz industrial imager concept**

## Meet Our Industrial Advisory Board

The School of Electrical and Computer Engineering is fortunate to have dedicated alumni and professionals to serve on its Industrial Advisory Board (IAB). Members of IAB are technical leaders in their industries and all of them have a wealth of engineering design and project management experience. They represent a wide spectrum of industries, including areas in power and energy, communications, digital and analog electronics, and defense. The board provides an important function by reviewing the School's academic programs and by providing sound counsel for continuous improvement and ABET accreditation. The activities of the board are designed to reassure students, parents and future employers that the School's baccalaureate programs are highly relevant and up-to-date. The IAB is a valued constituent of the School of Electrical and Computer Engineering. Four IAB members, Wes Ray, Bryan Burns, Greg Smith and Todd Hiemer, share their experiences as IAB members.



### Wes Ray becomes IAB President

Wes Ray joined IAB one year ago, 20 years after graduating from OSU, and recently became the president of the board. He is now the industrial interface systems manager at Texas Instruments (TI). A lot has changed since he earned his degree, including the new labs in ENDEAVOR.

"ENDEAVOR is pretty impressive," Ray said. "It is better than a lot of Fortune 500 companies that are making all the crazy products we use today, believe it or not. We've come a long way.

"When you come out of some of the older labs that are very dated, and have a very academic setting feeling to them, it's almost like a classroom. Based on just the layout, and the tools of ENDEAVOR, I think that is going to make students feel more at home when they finally do get into the work place."

The differences in a classroom and a lab make a world of difference for engineers. Especially when they enter the workforce.

"When a student walks into a workplace like TI, they are going to feel a lot more at home after having worked in ENDEAVOR!"

As a member of IAB, Ray hopes to help keep ECE's programs strong and relevant, and to continue to foster productive relationships with industry.

"I am all for forging bonds more closely with students earlier so they can really see what it is that

they are training to do some day," Ray said. "I think a lot of times they don't necessarily know. I like the responsiveness of OSU and CEAT. I think the fact that OSU's ECE is proactively going after input from the people that are going to be hiring their students is invaluable."



### Bryan Burns gives back to the program that made him a success

Solving real world challenges with technology has been IAB member, Bryan Burns', business for the past 40 years. Whether it's identifying safe landing strips in Antarctica or finding IED's before they explode, Burns has been instrumental in developing new technologies that have been used to save lives and

improve critical missions around the globe. Burns, a recently retired Senior Scientist from Sandia National Laboratories, has helped various government departments find solutions for a variety of challenging problems. Burns earned his bachelor's and master's degrees in ECE at OSU in the 70s.

"I am very appreciative for my background and grateful to OSU as it has propelled me along to become a senior scientist at the labs," Burns said. Burns appreciates the solid foundation the ECE program provided him to understand very sophisticated mathematical and scientific knowledge.

"The ECE program prepares students to build a career and further their experimental training in a variety of industries including the industrial giants such as Boeing or Lockheed Martin," Burns said. "We depend on that good foundation that OSU provides to

## ALUMNI

build on and expand on and take graduates to places we need them to go to help solve critical national problems.”

The cross disciplinary projects ECE promotes are seen as very important to Burns in his experience in the industry.

“Cross culture, cross discipline, cross thought process - understanding why people are approaching it a certain way are essential and OSU provides for this interaction,” Burns said.

As an IAB member, Burns appreciated the opportunity to contribute to the ECE program that is responsible for where he is today.

“The perspectives that were valid five years ago will not be valid five years from now,” Burns said. “The value that the advisory board brings to the program is instrumental in keeping the program current. Advice as to what to shift focus on is important and allows the university to adapt itself and to be most widely marketable in the market place of employment.”



### Greg Smith looks to ECE for employees

Greg Smith came to OSU in 1982 and earned a bachelor’s and master’s in ECE. He is currently the Missiles and Test Systems Customer Solutions Manager at Frontier Electronic Systems, Stillwater, the aerospace educator for the Civil Air Patrol in Stillwater and an IAB member. When

choosing a degree program as a high school student, Smith visited each discipline within CEAT. When he visited the electrical labs he said, “I’m home; this is the best.”

Smith has been involved in state-of-the-art technology development throughout his career working on some of the world’s most advanced and sophisticated technologies, from the F15 Eagle and the Minuteman ICBM, to the Global Hawk unmanned surveillance aircraft and the Aegis missile Defense System. From his senior management position, Smith looks to OSU’s ECE program to hire graduates.

“The graduates of ECE have the skills we need

for them to be innovators in our company,” Smith said. “Every year we hire three to five interns in the summer that shadow senior engineers. The ECE program at OSU is attractive because the school is good, ABET accredited, and on top of the technology trends in the market place, which makes the ECE programs one of the better ones in the country.”

Smith became involved in IAB through an effort to enhance collaboration between Frontier Electronic Systems Corporation and OSU. This provides Smith with the opportunity to review and contribute insights into the ECE program in order to keep it state-of-the-art. Having the opportunity to interact with faculty and students alike promotes his “iron sharpens iron” philosophy. “We really want to take what we need in industry, in terms of skills, and make sure those skills are reflected in the curriculum,” Smith said. “The ECE program gave me a wonderful life career.”



### Todd Hiemer recognizes the family formed through ECE

Todd Hiemer is currently the lead systems engineer at the Boeing Company. He is also an OSU ECE alumnus and IAB member.

“My experience on the IAB has been an awesome experience,” Hiemer said. “I have been able to give back to my alma mater

with industry insights and technology trends. I have also been able to provide insights from my involvement with ABET accreditation as a volunteer evaluator.”

When speaking to young adults about matriculating in ECE, Hiemer recognizes the family aspect unique to OSU as well as the abundance of opportunities to be involved.

“OSU has a very family oriented atmosphere,” Hiemer said. “The university has a wide variety of extracurricular activities and clubs to allow students to continue their growth. The professors at OSU are invested in developing students by acting more as mentors.”

But the relationships do not end at graduation.

“The alumni of OSU provide a huge network for graduates in the industry,” Hiemer said. “The alumni

provide a network of working engineers with an interest in welcoming new graduates. This network serves to provide mentoring to help with career advancement.

“The IAB provides the ECE department a link into industry. This link provides feedback into the

curriculum to meet industry and technology trends. This feedback will also allow curriculum improvement. The IAB is also another link for the department into industry for potential projects and knowledge transfer.” ■

## **ECE Industrial Advisory Board**

The mission of the ECE Industrial Advisory Board is to provide external council and feedback to the School of Electrical and Computer Engineering for the purpose of sustaining and growing academic excellence, maintaining curricula relevance, evaluating strategic resources and sustaining ABET accreditation. The IAB is a valued constituent of the School who are passionate about student success.

### **Wes Ray, President**

Systems Manager  
Transceiver Interface Group  
Texas Instruments

### **James Beauchamp**

Retired Air Force Electrical Engineer  
Senior Engineer, B-52 Program  
The Boeing Company

### **Todd Hiemer**

Lead Systems Engineer  
The Boeing Company

### **Jack Graham**

Consultant  
Graham and Associates

### **Steven Thornton**

Systems Engineering Manager  
L3 Technologies, Inc.

### **J. Gregory Smith**

Missiles & Test Systems Customer Solutions Manager  
Frontier Electronic Systems

### **Mike Gard**

Senior Project Engineer  
The Charles Machine Works

### **Bryan Burns**

Senior Engineer, Retired  
Sandia National Laboratories

### **Mike Black**

Senior Manager, Retired  
Raytheon

### **Billy M. Martin**

Senior Research Scientist  
Director Environmental Test Laboratory  
National Institute for Aviation Research

### **Kurt Jarvis**

Technology Director for Cybersecurity  
Tinker Air Force Base

### **Aaron Wiseman**

Field Applications & Systems Engineering Manager  
National Instruments

### **Kenneth M. Butler**

TI Fellow  
Analog Engineering Operations  
Texas Instruments

## ALUMNI



### Hard Work Pays Off for Young Entrepreneur Lee Easton, B.S. 2014

Oklahoma State University alumnus, Lee Easton, is a man who wears many hats. With two bachelor's degrees, four companies and a full-time engineering job, he knows what it means to work hard. He developed this mindset as a student in the School of Electrical and Computer Engineering at OSU.



*An exterior view of AutoBlox at night showing the concrete work and exterior lighting that ModernBox designed for a nice exterior appearance.*

Easton tried several different majors at OSU before ultimately finding his place in ECE.

"I did some reading and soul searching to ultimately find that I wanted to do things that would leave behind a positive impact and inspire others the way that I had been inspired," Easton said. "I felt like technology was the best route to take."

To be successful in college, Easton felt he had to work twice as hard as his classmates to keep up. But he believes that made him a better person.

"Half way through my sophomore year of college, I switched to ECE," Easton said. "From then on, for the next four years of school I was on campus from 8 a.m. to 12 a.m. every single day; yes, 16 hour days. I eventually

just got used to this and realized this is what it would take for me to keep up.

"I saw graduation as the end goal and thought of living a normal life with eight-hour workdays. Oh how I was wrong; life of an entrepreneur. All that being said, I would have never developed this work ethic if it hadn't had been for the switch into the ECE program."

One of Easton's first impressions of ECE was a hands-on learning experience that was tailored to his learning style.



*An interior view of AutoBlox, created by Lee Easton and ModernBlox, showing three remote controlled roll up doors for a client's car collection. This view shows five, 40-foot shipping containers all cut open and connected side-by-side.*



*This product, designed by Lee Easton (right) and ModernBlox, called BarBlox, is a 20-foot shipping container turned into a full service bar for a client in Downtown Tulsa.*

“I remember my intro to engineering class with Dr. Latino,” Easton said. “We built Styrofoam boats with a single electric motor. The goal was to split into teams and design the best craft and make it the furthest distance. Right off the bat we were learning about teamwork, design practices, budget, timeline and documentation. These are all skills that are important in any career. For me, it was the hands-on learning practices like this that made the School of Electrical and Computer Engineering stand out over the others. Now I visit campus and I see the ENDEAVOR Lab. Why would anyone not want to go here?”

Easton graduated with two bachelor’s degrees in computer engineering and electrical engineering in May 2014.

Since graduating, Easton has held a full-time engineering job at ConocoPhillips. He has also founded four companies. His two favorite companies he has founded are Aerovision.io and ModernBlox. Aerovision.io, where Easton holds the title of president, is a tech-based marketing company that helps businesses around Tulsa collect data on their processes and converts that data into cost saving opportunities. At ModernBlox, Easton, vice president, designs and builds commercial and residential properties out of shipping containers with two other OSU alumni, Ben Loh and Swapneel Deshpande.

“I almost switched my major in college to architecture. ModernBlox has helped me scratch that itch,” Easton said. “We recently built a 1,600 square foot custom car garage out of five, 40 foot shipping containers for a client in Tulsa that collects classic cars. We called it AutoBlox. We have done projects from Tulsa all the way to Detroit, Mich. and Atlanta, Ga.”

When asked what makes the School of Electrical and Computer Engineering unique, Easton had two words: “the people.”

“I had the best experience developing great relationships with my professors and my classmates,” Easton said. “This was probably the best part of the whole college experience for me. The ECE department felt like my second family. I could walk into any professor’s office any time I wanted to ask a question.”

And for future and current ECE students, Easton stresses the importance of building relationships.

“Now that I am out of college, I cannot stress how important networking is,” Easton said. “Relationships have proven to be so important in the past four years of my life after graduating from OSU. I simply would not be where I am today if it wasn’t for some of the amazing people I’ve met along the way.” ■



### Stunkel Makes an Impact with IBM

**Craig Stunkel, B.S. 1982, M.S. 1983**

Electrical and Computer Engineering alumnus from Oklahoma State University, Craig Stunkel, has made a career of solving problems in the computer world; and it doesn't look like he's slowing down any time soon.

Stunkel's love for computers peaked at an early age.

"My uncle worked at Jet Propulsion Laboratory and he would sometimes bring little gadgets home from there. I think that's what really piqued my interest," Stunkel said.

Stunkel grew up in Stillwater where he attended high school. One thing that stuck out in Stunkel's mind was OSU's teletype terminals that OSU would allow students to use and write programs on. It was at this time, and the fact that Stunkel enjoyed his physics class, that his fascination for computer hardware grew even more.

After graduating high school, Stunkel was admitted into the electrical engineering program at OSU.

"I really liked that OSU engineering emphasized making sure you didn't just learn about your discipline of engineering, but you learn a little in all disciplines of engineering," Stunkel said. "I took a civil engineering class, a fluid dynamics class, and a thermodynamics class with Rob Robinson. You got a taste of all of those, which I think is very valuable, especially working in industry."

While attending OSU, he remembers his instructors being very accessible, which is very important for the success of engineering students. He was also on the OSU basketball team, and long practices and away games would sometimes cause conflicts. The EE professors were well aware of his situation and were willing to provide some flexibility. They appreciated his willingness to turn in assignments and take tests early. Between basketball and engineering, free time was a luxury.

After receiving his bachelor's degree in 1982 and his master's degree in 1983, both from OSU, he immediately went to work for IBM developing computer hardware.

"It was fun at the time, but I always knew I wanted to pursue my Ph.D. I also knew I needed a break from the academic world," Stunkel said. "I worked for three years in Rochester, Minn. for IBM, but then went back to school at the University of Illinois to pursue my Ph.D. in electrical engineering."

Stunkel started out thinking he wanted to have a career in the brand new field of artificial intelligence. He saw himself being part of a hardware design team.

"After taking a few courses in this area, I decided that they don't know what they're doing! This was too new and too early," Stunkel said.

He then took another class called parallel processing, and from there Stunkel knew exactly what he wanted to do and where he wanted to focus his studies. Parallel processing focuses on how to get a vast array of computers networked together to solve a problem faster.

"For some things, it matters how fast you solve them," Stunkel said. "Weather is a great example. Just because you know what the weather was ten days ago doesn't really help you now."

After receiving his Ph.D. in 1990, Stunkel chose to stay with IBM, but changed his career focus. He was part of a team that worked on a project that created IBM's first commercial supercomputer, the IBM SP system, which was introduced in 1994.

He now works as a principal researcher in IBM's main research laboratory, the T.J. Watson's Research Center located north of New York City. The Center has about 1,500 employees with half of them possessing a Ph.D. Having access to that many experts allowed Stunkel to thrive in his career. Stunkel is currently the network lead in the data centric systems department. This team architected the CORAL supercomputer systems delivered to two U.S. national laboratories in 2018, one of which is currently the world's fastest supercomputer.

Stunkel recently visited CEAT at OSU where he was



IBM's Summit supercomputer.

a guest speaker for the ECE Distinguished Speaker Seminar. While there, he had the opportunity to tour CEAT's new undergraduate laboratory facility, ENDEAVOR, and visit with current engineering students.

"STEM in general, and of course engineers, are more important than ever," Stunkel said. "We need to help society understand the importance of what we're doing. We're going through a transition right now, much like the industrial revolution. The industrial revolution overall was an amazing transition, but it wasn't fun for a lot of people at the time. We're going through another one of those transitions right now, and we aren't sure where it's going to end up. That's extremely uncomfortable for a lot of people, but as engineers and any kind of STEM professional, it's important that we try to help people find the optimistic parts of it, and to help find where they fit in and can transition themselves."

When asked what advice he has during periods of high transition he said, "be open to all sorts of new ideas. Be aware of transitional things and where engineers can

contribute that might not be obvious now.

"One of those big areas right now that will completely change all of our lives, and we have no idea how, is the area of artificial intelligence, particularly machine learning and deep learning. Unpredictable things are going to happen, but engineers, particularly electrical engineers and computer engineers, are going to be so important and have such an impact on that transition. So think crazy things, things that people will typically say are ridiculous or impossible."

Since the start of his accomplished career, Stunkel has contributed to the network architecture and design of many other IBM supercomputers. He has received four IBM Outstanding Technical Achievement Awards for his work, and he holds 15 U.S. patents related to switching networks. He is also a Fellow of the Institute of Electrical and Electronics Engineers, the world's largest technical professional organization for the advancement of technology. ■

## NOTES AND NOTICES

### ECE Holds its Third Distinguished Seminar Series

The third annual ECE Distinguished Seminar Series featured three internationally recognized researchers this year. This seminar series is intended to provide an open platform for the faculty and students to have a dialog with leading researchers in various fields of ECE and to build up a dynamic and vibrant culture of research and academic exchange in the ECE department. All seminars are free and open to the public.



#### Person-Centered Multimedia Computing: A New Paradigm Inspired by Assistive and Rehabilitative Applications

**Dr. Sethuraman "Panch" Panchanathan**

Executive Vice President, ASU Knowledge Enterprise Development  
Chief Research and Innovation Officer  
Arizona State University



#### NASA and the Jet Propulsion Laboratory: Quo Vadimus? Where are We Going?

**Dr. David H. Atkinson**

Senior Systems Engineer  
Jet Propulsion Laboratory



#### Supercomputer Network Trends

**Dr. Craig Stunkel**

Principal Research Staff Member and Network Lead, Data-Centric Systems  
IBM T.J. Watson Research Center

### ECE's Neda Nourshamsi Receives 2018 Graduate College Summer Fellowship



ECE Ph.D. candidate, Neda Nourshamsi, was selected by OSU's Graduate College to receive a 2018 Graduate College Summer Fellowship. Nourshamsi has been working on several projects with Dr. Charles Bunting's research group in the School of Electrical and Computer Engineering and NASA to protect satellite systems from electromagnetic interference during launch.

## ECE Welcomes Two New Faculty Members

### Dr. Wooyeol Choi



Dr. Wooyeol Choi joined the School of Electrical and Computer Engineering at OSU as an assistant professor in the fall of 2018. He was with the University of Texas in Dallas, Texas for seven years, first as a research associate and later as an assistant research professor. He received his Ph.D. and M.S. in electrical engineering from Seoul National University, Seoul, Korea, and his B.S. in electronic engineering from Yonsei University, Seoul, Korea.

### Dr. Ickhyun Song



Dr. Ickhyun Song joined the School of Electrical and Computer Engineering in OSU in fall 2018. He received his B.S. and M.S. degrees in electrical engineering from Seoul National University, Korea, in 2006 and 2008, respectively, and his Ph.D. degree in electrical and computer engineering from Georgia Institute of Technology, Atlanta, Ga. in 2016. From 2008 to 2012, he was a design engineer at Samsung Electronics Company, Korea, where he contributed to the development of next-generation memory products. Prior to joining OSU, he was a member of the School of Electrical and Computer Engineering, Georgia Institute of Technology, as a research engineer.

## New Graduate Degree: Master of Engineering in Electrical Engineering (MEngEE)

Oklahoma State University is constantly seeking ways to provide a vast array of educational options to enhance the professional and economic status of its constituents. To that end, the School of Electrical and Computer Engineering is pleased to announce the creation of a new graduate degree program: Master of Engineering in Electrical Engineering (MEngEE). This program augments our existing baccalaureate electrical engineering (BSEE) and computer engineering (BSCpE) degree programs, and our graduate degree programs—Master of Science in Electrical Engineering (MSEE) and Ph.D. in Electrical Engineering (PhDEE). Taken together, these five programs provide a full cadre of options for just about anyone at any phase in their professional career.

The Master of Engineering program is distinctive from the Master of Science program by being a non-research, non-thesis degree program. Its focus is on professional development, advanced knowledge, and 33 credit hours of course work. It is perfect for individuals who seek to be highly qualified for high-tech industrial positions that require knowledge and skillsets beyond what is gained in a baccalaureate degree. It is also ideal for people who seek to enhance their credentials for more substantive career opportunities and promotions.

There are two features of the MEngEE program worth highlighting. First, it is fully online. This means that students can seek this degree without being place-bound in Stillwater or being tied to a rigorous schedule of class times. Second, it can be fully coupled with our baccalaureate degrees to create a “4+1” option. This option (available only to OSU BSEE/BSCpE students) allows nine dual credit hours of the BS program to be applied to the MEngEE program, thus reducing the MEngEE program to 24 credit hours and suggesting that the BS degree is completed in four years along with an additional year for the MEngEE degree.

To learn more about all of our degree programs, please visit our ECE web page: [ece.okstate.edu](http://ece.okstate.edu).

## NOTES AND NOTICES



### **Subhash Kak Appointed to Prestigious Commission**

Subhash Kak, Regents Professor in electrical and computer engineering at Oklahoma State University, has been appointed to the Indian Prime Minister's Science Technology and Innovation Council. The committee consists of 21 members whose main task is to advise Prime Minister Narendra Modi and ten ministries in India on policy matters related to science, technology and innovation.

Kak holds a bachelor's and doctoral degree in electrical engineering. He joined OSU in 2007 as head of the computer science department before transferring to electrical and computer engineering in 2014. His research focus includes artificial intelligence, cryptography, neural networks and quantum information. He has developed new codes for computing and cryptography, worked on a variety of problems on data and network security, and originated one of the two methods of quantum cryptography. Kak is the author of 20 books, some of which have been translated into French, German, Italian, Spanish, Korean and Serbian. His many awards include British Council Fellow, National Fellow of the Indian Institute of Advanced Study, Distinguished Alumnus of IIT Delhi, and Science Academy Medal of the Indian National Science Academy.



### **Jeffrey Young Selected for Sandia National Laboratory Engineering Science External Review Board**

Jeffrey L. Young, OSURF Endowed Chair of Engineering and ECE Head, was selected as a member of the Sandia National Laboratory (SNL) Engineering Science External Review Board. The Board provides assessment and advice to the Sandia Chief Research Officer, Sandia Engineering Sciences Director, and Senior Manager of the Sandia Research Foundation on matters pertaining to the engineering mission and programs of SNL Research Foundation.

The board consists of ten members who hold significant leadership positions at the University of Texas, Austin, University of Tennessee Space Institute, Raytheon Missile Systems, Oak Ridge National Laboratories, Georgia Institute of Technology, Los Alamos National Laboratory, University of California (Irvine), Air Force Research Laboratory, and NASA Langley Research Center. Professor Young's four year term started April 1, 2018. His primary contribution to the board will be to provide expert engineering and science advice on electromagnetic systems, devices, testing and simulation.



### **Professor James Stine Awarded \$1.5M Grant from the Air Force and Department of Defense**

Computer engineering professor and Earl and Carolyn Glimp Professor of Engineering, James Stine, has been awarded the first phase of a three year, \$1,504,372 research grant from the United States Air Force to design low-energy, high performance, application-specific computer architecture for 14nm and 7nm CMOS. The award is part of the Air Force's Future Autonomous Battlespace RF w/Integrated Communications (FABRIC) Project, which is a transformative, communications program appropriate for Access/Area Denial environments. The overall goal is to provide combat-ready, cyber-hardened, power efficient, embedded computer architectures.

"We are grateful for the support from the Air Force Research Laboratory and the Department of Defense," Stine said. "This grant will enable my laboratory to advance computer architecture and VLSI design, as well as help us explore the areas in low-power strategies for application-specific implementations. I also believe that this opportunity will continue the tradition of excellence that Oklahoma State University exudes."

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