

# ECE NETWORKS

## 2023 | ELECTRICAL & COMPUTER ENGINEERING



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# LETTER FROM THE DEPARTMENT HEAD

It is an immense pleasure to begin this letter by reporting that the aspirational goal of transforming Engineering South (ES) into a modern office complex has been realized. With the help of the OSU administration and a generous group of donors, Engineering South reopened its doors in August 2023. The building has exceeded our expectations by offering spacious and well-lit offices, a sophisticated IT and HVAC infrastructure, ample meeting spaces for faculty and students, and a high-tech seminar room. The front door of the School of Electrical and Computer Engineering (ECE) is strategically placed at the top of the grand central, historical staircase and is architecturally integrated with the signature, south side Palladium window. A terrazzo inlay depicting the field lines of a magnet serves as the focal point of the second floor and caps off the design by complimenting the historical zodiac inlay on the first floor.

The project took over four years and about \$27 million to complete but the wait and expense was worth it. ES will serve ECE for decades to come. I would like to personally thank ECE's alumni and friends whose generous financial support allowed the ES project to become a reality. Please join me by recognizing the following people and the spaces they named:

- **Room 200:** The Jack H. Graham Reception Lobby
- **Room 201:** The Chuck Barnette Advising Office (made possible by James Barnette)
- **Room 209:** The Earl J. Tuttle Conference Room (made possible by Marcia Tuttle and Linda "Tuttle" Mattison)
- **Room 216:** The William L. Wylie, PE Office
- **Room 225:** The Dhanwanti Sudan Office
- **Room 226:** The Rama & Gokula Ramakumar Seminar Room
- **Room 230:** The Steven & Judy Wear Student Success Center
- **Room 237:** The Cal and Marilyn Vogt Conference Room
- **Room 269:** The Earl Glimp Office

(Other naming opportunities are still available. Should you wish to name an ES space or contribute to ECE, please feel free to contact me. More information about giving to ECE is found on the back cover of this newsletter.)

In addition to thanking our donors, a big call out is given to Rand Elliott Architects, OSU Long Range Facilities Management, CMSWillowbrook Construction, CEAT Facilities Services, OSU Foundation, School of Architecture, School of Mechanical and Aerospace Engineering, and CEAT Marketing. It took a big team to take on this huge project and the team was exceptional. Thanks to all.

Putting aside the completion of Engineering South, 2023 was another exceptionally good year for ECE. Our students are securing good, high-paying jobs; the faculty are providing exceptional instructional services to our students and excelling in their research; our instructional and research laboratories are state-of-the-art; we are hiring exceptional talent; and our alumni are getting significant recognition.

For example, we are pleased to welcome Drs. Hyusim Park and Pejman Ghasemzadeh. Dr. Park graduated from the University of Texas, Arlington. She specializes in sensors, embedded systems, and analog integrated circuits. Dr. Ghasemzadeh graduated from the University of Nebraska, Lincoln. He specializes in 5G and 6G communication systems, internet of things, and machine learning. I am confident both Dr. Park and

Dr. Ghasemzadeh will make significant contributions to our teaching and research mission.

Moreover, we are proud of the achievements of Dr. O'Hara who recently won the prestigious National Science Foundation CAREER Award. Valued at \$500k, this award will allow Dr. O'Hara to continue his pioneering research in next generation communication systems. Equally so, Dr. Fan brought honor to himself and ECE by receiving the OSU Regents Distinguished Research Award at the OSU Honors Convocation. This award celebrates Dr. Fan's pioneering research in image processing, machine learning, pattern recognition, and computer vision.

As another example, ECE delights in the achievements and contributions of Dr. Craig Stunkel. Dr. Stunkel (BSEE, 1982; MSEE, 1983) has had an extensive career in high performance computer networks while working at IBM and NVIDIA. His career was recognized this year by being inducted into CEAT's prestigious Hall of Fame. Congratulations to Dr. Stunkel.

As we hired faculty into the department, we also saw faculty retire in the same year. Dr. James West, after 34 years of dedicated employment with OSU, announced his retirement. As many of our readers know, Dr. West was a rigorous teacher who expected his students to excel in the classroom. At the same time, he was an accomplished scholar who made significant contributions to the technical areas of computational electromagnetics, statistical electromagnetics, and electromagnetic compatibility. In 2022, he received the IEEE Electromagnetic Compatibility Society's Technical Achievement Award. His unique wit and unwavering service to ECE caps off his enduring legacy. We wish Dr. West and his family the absolute best in the years to come.

On a sadder note, ECE mourns the loss of a trusted colleague and professional friend, Dr. Rao Yarlalagadda, who passed away in 2023. Yet, his legacy lives on in the numerous graduate students that he mentored as PhD students. He will be missed. As for ECE students, they are the best. In 2023, three ECE students were honored at the CEAT Annual Awards Banquet. Lenna Abouzahr was named 2022 CEAT Student Council Member of the Year. Sahir Virani was named the 2022 ECE Outstanding Senior. Le Zhou was named the 2022 ECE Outstanding Graduate Student.

After being Head of ECE for the past eight years and counting, I can say with confidence that ECE has an outstanding culture of professionalism, a productive team of faculty and staff, and a student body that will be well prepared for the professional workforce. I am proud of the ECE enterprise and look forward to another momentous year.



Sincerely & Go Pokes,  
Jeffrey L. Young  
ECE Professor and Head



Kaylee Rolph

## ECE Student Named an OSU Senior of Significance

ECE is proud to announce that Kaylee Rolph has been named an OSU Senior of Significance. She is one of three CEAT students to be chosen for this distinguished recognition by the OSU Alumni Association and one of 59 students selected from all five OSU undergraduate colleges that represent the top one percent of the Class of 2024. The Seniors of Significance Award recognizes students who have excelled in scholarship, leadership and service to campus and community and have brought distinction to OSU.

## ECE Student Thomas Kidd Receives IEEE PES Scholarship

Thomas Kidd, an ECE student, received a scholarship from the IEEE PES Scholarship Plus program for the second time. The Institute of Electrical and Electronic Engineers (IEEE) Power and Energy Society (PES) is the world's premier scholarly organization pertaining to all things associated with electrical energy and power generation, transmission, and distribution. Thomas was selected as one of the scholarship recipients from a highly competitive pool of applicants across the country.

The IEEE PES Scholarship Plus Initiative supports promising students through financial assistance in the increasingly expensive enterprise of undergraduate studies. Funds are paid directly to the university to help defray educational costs. Recipients of PES engineering scholarships are high achieving undergraduate students in electrical engineering who have committed to exploring the power and energy fields through both coursework and career experiences. These students will graduate with the knowledge and skills necessary to start impacting the power and energy industry.



Thomas Kidd

Thomas Kidd currently serves the school and his classmates by being the Vice President of the IEEE Student Branch Chapter at OSU.

## Spring 2023 Senior Design Expo Highlights



Pictured left to right: Joshua Skillings, Jade Gullic, and Brendan Schwickerath.

ECE students Joshua Skillings, Jade Gullic, and Brendan Schwickerath received the First Place Award in the ECE category of the College of Engineering, Architecture and Technology's Senior Design Expo. Their team, named "Phoenix" and mentored by Prof. Tyler Ley (Civil Engineering) and Dr. Guoliang Fan (ECE), developed an automated test measurement system to determine water content in concrete mixtures and aggregates. The Senior Design Expo is a signature event of CEAT that showcases capstone design projects from the academic units of the college. It was hosted on April 28, 2023, in CEAT's state-of-the-art instructional laboratory, ENDEAVOR.

# STUDENTS AND FACULTY

## Fall 2022 Senior Design Expo Highlights



*Pictured from left to right: Nate Lannan, Parker Plank, Dawson Kinser, and Douglas Edmondson.*

ECE Seniors Parker Plank, Dawson Kinser, and Douglas Edmondson were awarded the ECE Best Senior Design Project at the CEAT Senior Design Expo, on December 2, 2022. The project, “Automating the Super Air Meter,” was advised by Dr. Gary Yen, ECE, and Dr. Tyler Ley, Civil Engineering. Professor Nate Lannan provided guidance as the instructor of record for ECE’s capstone design course, ECEN 4024. According to one judge, their project was “outstanding, interdisciplinary, and innovative.” The aim of the project was to automate the Super Air Meter, a quality assurance device that determines the lifespan of concrete. Automation is paramount in the construction

industry due to a lack of highly skilled laborers. The automation of the Super Air Meter reduces the time and complexity of testing concrete. The team designed a complex control system to precisely operate sensors, actuators, relays, pumps, vibrators, and solenoids to accurately recreate the steps necessary for a human operator to run the Super Air Meter. In addition, the team designed a practical and easy to use interface equipped with push-button controls, a display, and a removable data storage device.

## Three ECE Students Honored at the CEAT Awards Banquet

Three Electrical and Computer Engineering students were honored at the College of Engineering, Architecture and Technology's Faculty, Staff and Student awards banquet held on April 11, 2023. At the banquet, Lenna Abouzahr was named CEAT Student Council Member of the Year, Sahir Virani was named the 2022 ECE Outstanding Senior, and Le Zhou was named the 2022 ECE Outstanding Graduate Student.



*Lenna Abouzahr (right) receiving her award.*



*Sahir Virani (left) receiving his award.*



*Le Zhou receiving his award.*

## Steven Howell Recognized as a Wentz Research Scholar



*Steven Howell*

Steven Howell, an ECE senior, was recognized as one of OSU's 2022-2023 Wentz Research Scholars. His research proposal, entitled "Supporting Activities of Daily Life for Seniors via AI Assistant," focused on the application of a natural language processing tool for smart homecare of elderly people. His advisor is Dr. Guoliang Fan, a professor in the School of Electrical and Computer Engineering.

The Lew Wentz Foundation and the Henry Bellmon Office of Scholar Development and Undergraduate Research provide support for the nationally recognized Wentz Research Scholars program. Approximately 40 undergraduates are awarded one-year, \$4,500 Wentz Research stipends to conduct independent research with the guidance of a faculty mentor in any field of study. The prestigious scholarship helps prepare these scholars for graduate study or national competitions.

## ECE Graduate Wins First Place in 3MT Competition

On October 9, 2023, ECE Ph.D. Student Zhidong Su placed first in CEAT's 3 Minute Thesis (3MT) competition. The 3MT is a research communication competition that challenges research degree-seeking students to present a compelling oration on their thesis/dissertation topic and its significance in just three minutes using just one static slide. In the competition, Zhidong presented his research entitled "Conversation-based Medication Management System for Older Adults using A Companion Robot." Zhidong Su is supervised by ECE professor Dr. Weihua Sheng.



*Zhidong Su presenting his work during the 3MT competition.*

## STUDENTS AND FACULTY

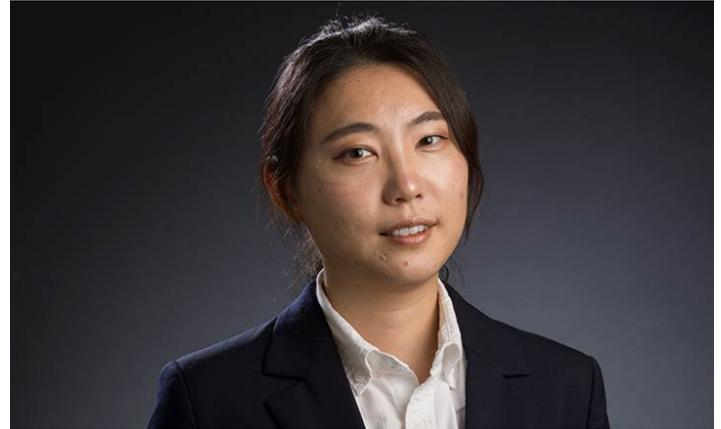
### ECE Welcomes Two New Faculty Members

ECE is pleased to welcome its two newest faculty members to the school: Drs. Hyusim Park and Pejman Ghasemzadeh. Both joined ECE in August 2023.



*Dr. Pejman Ghasemzadeh*

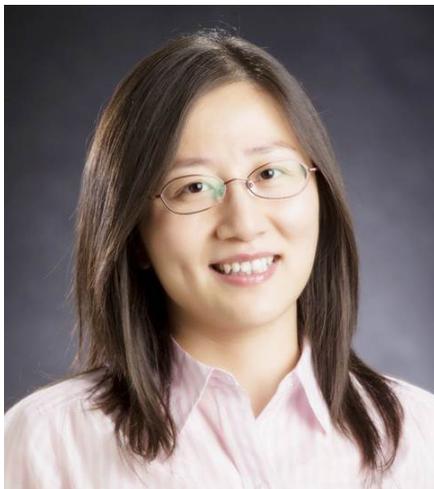
Pejman Ghasemzadeh received his M. Sc. and Ph.D. degrees in Telecommunications Engineering and Computer Engineering from the University of Nebraska-Lincoln in 2020 and 2023, respectively. His research focuses on the cutting-edge application of efficient machine/deep learning models as well as signal processing techniques to advance wireless communication systems, including the evolution of technologies like 5G and the exploration of future communication frontiers such as 6G and THz communications.



*Dr. Hyusim Park*

Dr. Park received her Ph.D. in Electrical Engineering from the University of Texas at Arlington (UTA) in 2021 and subsequently worked as a post-doctoral research associate in UTA's Department of Electrical Engineering. Her research interests include bio/chemical sensing integrated circuits and embedded systems for applications in smart farming, health monitoring devices, and environmental sensing. Her current work focuses on designing portable environmental sensors for monitoring temperature, chemical composition, gas, smoke, and pressure. In addition, she is actively involved in the development of biomedical sensors for quantifying biomarkers and tracking disease outbreaks. Dr. Park's expertise lies in designing portable and implantable sensing systems, emphasizing miniaturization, battery-powered operation, real-time sensing capabilities, wireless network operation, enhanced sensitivity, and rapid data processing.

*Dr. Qi Cheng*



### ECE Welcomes Back Dr. Qi Cheng

Qi Cheng obtained her M.S. and Ph.D. degrees in electrical engineering from Syracuse University, in 2003 and 2006, respectively. From August 2006 to December 2017, she was an assistant professor and later an associate professor at the School of Electrical and Computer Engineering at Oklahoma State University. During her tenure at OSU, she also spent time as a Research Fellow, working at the Air Force Research Laboratory in Rome, New York, from 2015 to 2016. In 2017, she joined the research staff at Lawrence Livermore

National Laboratory in Livermore, California, where she worked until 2021. This year she returned to Oklahoma State University as an associate professor. Her current research interests are in machine learning, big data analytics, modeling and statistical inference. She specializes in collaborative intelligence and transforming big data to knowledge, with their applications to large complex networked systems and cyber-physical systems. She received NNSA Joule Award from the National Nuclear Security Administration in 2019. She is a Senior Member of the IEEE.



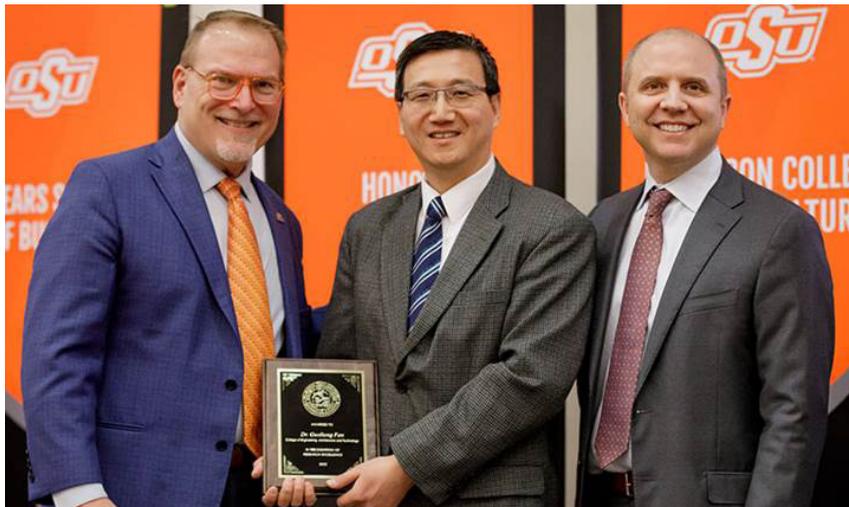
*Dr. John O'Hara*

## **Professor John O'Hara Receives Prestigious NSF CAREER Award**

The National Science Foundation recently awarded a \$500k grant to ECE Associate Professor Dr. John O'Hara for his proposed project "CAREER: Taming the Terahertz for 6G Wireless Backhaul," which will be conducted over a five-year period. Per NSF, "The Faculty Early Career Development (CAREER) Program is a Foundation-wide activity that offers the National Science Foundation's most prestigious awards in support of early-career faculty who have the potential to serve as academic role models in research and education and to lead advances in the mission of their department or organization. Activities pursued by early-career faculty should build a firm foundation for a lifetime of leadership in integrating education and research."

Dr. O'Hara joined OSU in August 2017 as part of ECE's DC-to-light, next generation communications strategic initiative. Having been mentored by terahertz pioneer Dr. Daniel Grischkowsky and employed by Los Alamos National Laboratories, Dr. O'Hara was the ideal candidate to further develop ECE's experimental capabilities in advanced wireless technologies. To date, Dr. O'Hara and his colleagues have built and acquired an impressive set of hardware assets for continuous-wave and short-pulse communication technologies. Dr. O'Hara's project will leverage these facilities to explore system architectures and channel models needed for 6G communication systems.

## **Dr. Guoliang Fan Receives OSU Regents Distinguished Research Award**



*Dr. Guoliang Fan (center) receiving the Regents Distinguished Research Award.*

ECE Professor Dr. Guoliang Fan was recognized as the recipient of the OSU Regents Distinguished Research Award at the 2023 OSU Awards Convocation for his contributions to image processing, computer vision and machine learning with their applications in biomedical and robotics technologies. His research endeavors have been supported by National Science Foundation (NSF), National Institutes of Health (NIH), Federal Highway Administration (FHWA), Army Research Office (ARO), NASA, and Oklahoma Center for Advancement of Science & Technology (OCAST). This is the 20th year that Regents

Distinguished Research Awards have been presented. Faculty chosen for this award have been judged by their peers to have a distinguished record of past and continuing excellence in research that is recognized nationally and internationally. This award includes a \$2,000 permanent stipend.

## STUDENTS AND FACULTY



*Dr. Guoliang Fan*

### **Professor Guoliang Fan Named Best Associate Editor**

The IEEE Journal of Biomedical and Health Informatics (JBHI) named ECE Professor Guoliang Fan as one of three Best Associate Editors for 2022. With an impact factor of 7.02, J-BHI is a fast-growing journal that utilizes over 90 associate editors. J-BHI publishes original papers describing recent advances in the field of biomedical and health informatics where information and communication technologies intersect with health, healthcare, life sciences and biomedicine. Dr. Fan holds the Cal and Marilyn Vogt Professorship. His publications in machine learning, pattern recognition, and computer vision have been widely cited by his international peers.

### **Award for Academic Excellence in Academic Program Assessment - Keith Teague and James West**

ECE Professors, Dr. Keith Teague and Dr. Jim West, received the Award for Academic Excellence in Academic Program Assessment. This award, along with a \$500 stipend, recognizes academic program assessment individuals or teams who demonstrate innovation, excellence and dedication to program outcomes assessment planning, reporting, and implementation.



*Drs. James West (center) and Keith Teague (right).*

### **Dr. Weili Zhang Among Most Highly Cited Worldwide**



*Dr. Weili Zhang*

ECE Professor Dr. Weili Zhang was named a Clarivate Highly Cited Researcher for the fourth year in a row due to his pioneering work in terahertz (THZ) imaging, spectroscopy, plasmonics, and metasurfaces.

He is only one of two researchers in the OSU system to receive this award during 2022. In total, his research has been cited more than 17,500 times. He has an H-Index of 68 (i.e., 68 of his publications have been cited more than 68 times).

## The Cyclone Cowboys Compete in the 2023 National Collegiate Wind Competition

The Cyclone Cowboys, an ECE student group advised by ECE Assistant Professor of Practice Nate Lannan placed 11th in the 2023 Collegiate Wind Competition. The CWC is an annual competition that prepares college students for jobs in the wind energy workforce through real-world project development and outreach experience.



*The Cyclone Cowboys Team.*

“All of the teams competing have been working hard, and for us to be chosen in our first year is really exciting,” said Professor Lannan. “We were selected due to all the hard work and long hours that everyone on the team has put in. The team consists of many people with a wide range of skills that have really come together as a unit. It has been very rewarding to be a part of.”

The student team consisted of 30 people and was led by:

- Sahir Virani - Overall team lead and electrical lead (electrical engineering)
- Tristan Kohn - Outreach team lead (mechanical engineering)
- Ben Marquis - Turbine design team lead (mechanical engineering technology)
- Hunter Reitze - Wind farm site design team lead (mechanical engineering technology)

The team was selected as one of 13 finalists from over 30 entries to compete in the CWC final events in May 2023. Finalists were selected based on an evaluation of their preliminary design report for a prototype wind turbine, preliminary design for a hypothetical offshore wind farm site, a community education and outreach plan, and a report on the relationships each team has established with members of the wind industry.

The competition finals focused on turbine design, offshore wind farm design, and outreach. The Cyclone Cowboys placed 10th in project development, 12th in outreach, 10th in turbine performance, and 11th overall.

## STUDENTS AND FACULTY

### The Cyclone Cowboys Outreach Activities

As part of the outreach component for the National Collegiate Wind Competition, the Cyclone Cowboys worked with Tiffanie Gray, the gifted and talented education coordinator at Westwood Elementary School in Stillwater. Lannan and the CWC team brought over 20 wind kits to the school and worked with 80 fourth and fifth graders over a week to help them experiment with the various methods of converting wind turbine motion into electrical output.

“Each of the Cyclone Wind Team students that visited our classroom were professional, patient with the multitude of questions and truly engaged students in problem-solving at a high level,” Gray said. “Even after they left, my kids continued to experiment with the shape and length of their air foils to see whether those changes increased or decreased the wind turbine's efficiency. We have reached out with questions since then and have always received quick and thoughtful responses that help us continue to learn about wind energy.”

“The STEM activities at Westwood Elementary and the Cyclone Cowboys received financial backing from the School of Electrical Engineering's Renewable and Innovative Sustainable Energy (RAISE) program, which is funded by a generous donation from the Martin Family Foundation,” said Jeffrey Young, department head of electrical and computer engineering.

Moving forward, Professor Lannan is continuing to lead the Cyclone Cowboys and the team is currently preparing their submission to the 2024 CWC. This year, OSU has partnered with Kathy Jackson's team at Northern Oklahoma College to increase involvement and impact of the project. “This is something I would like to lead going forward,” Lannan said. “Currently, we have student involvement from electrical and computer, mechanical and aerospace, civil, mechanical engineering technology, chemical and industrial engineering students. We would love to expand this to include more schools and colleges beyond CEAT.”



*Outreach activities in Westwood Elementary, Stillwater, OK.*

## Student Activities: IEEE-OSU News

Oklahoma State University's IEEE student branch aims to fulfill its prescribed duty to provide "students a community of peers, and a connection to faculty and industry professionals who drive innovation in countless technical fields." The students involved in this branch work hard to provide engaging activities and events in efforts to foster community amongst students, faculty, and staff alike.

IEEE activities in the Spring of 2023 included a board game night for members, research presentation by OSU graduate student Andrew Ash, and a field trip to Ditch Witch's facilities in Perry, OK. IEEE also participated in the "1 is 2 Many" sexual assault awareness banner-making event.

In March, OSU ECE alumnus Marshall Sewell and others from the Naval Surface Warfare Center Dahlgren Division (NSWCDD) hosted an information session with IEEE. More than 20 students had the opportunity to learn about Sewell's research into electromagnetic systems and opportunities involved with the group. Sewell shared how his training, including his time at OSU, gave him the opportunity to join the NSWCDD program.

During the 2023-2024 academic year, the branch is led by President Juliette Reeder (junior), with Vice President Thomas Kidd (senior), Secretary Zach Wilson (senior), Treasurer Jerry Mitchell (senior), and CEAT Student Council Chair Tyler Graham (senior). A highlight of 2023 was the long-awaited opening of the grandly renovated Engineering South.



*Thomas Kidd holding IEEE's "1 is 2 Many" banner supporting sexual assault victims*

OSU's School of Electrical and Computer Engineering now has a home on the second floor of the building, warmly centering students in the heart of the department. By extension, the IEEE student branch has access to a large, beautiful lounge with close access to faculty and staff. Students are already settling into this new space and look forward to utilizing the comfortable and spacious environment that has been made available thanks to numerous generous donors.

The student branch kick-started the 2023-2024 academic year with a banquet in early September with alumni speaker Blaine Bunch. Bunch spoke to IEEE members about his path from graduating with an electrical engineering degree in 1989 to where he is professionally today. He informed students about the recent partnership he helped establish between General Electric and OSU to help faculty and students work with the combination of microgrids and artificial intelligence. Students at OSU are now being given the opportunity to get involved with the new power equipment and AI management solutions intended to effectively harness renewable energy sources. This technology, through research and capstone design projects, brings an exciting



*First meeting in the Steven & Judy Wear Student Success Center in the newly renovated Engineering South.*

## STUDENTS AND FACULTY

### Student Activities: IEEE-OSU News (cont.)

facet of renewable energy for ECE students to be involved in. The banquet was a considerable success, and the students enjoyed a \$100 scholarship from ECE that aimed to inspire the new members of the chapter. The students thank Blaine Bunch, Dr. Jeffrey Young (ECE Head), and Kristal Soderstrom Junkens (ECE Advisor) for their help in creating a welcoming, successful back-to-school banquet.

The student chapter plans to hold meetings and events throughout the academic year. Every Wednesday, IEEE officers use the new popcorn machine to make popcorn for all ECE students, faculty, and staff to encourage connection. IEEE hosted a resume workshop in preparation for the Career Fair this September, offering example resumes and giving pointers on what to include. Several more activities

are planned for the semester, such as a professional development session with Boeing, bingo night, and an IEEE tailgate.

The student chapter hopes to attend the 2024 IEEE Region 5 conference in Springdale, Arkansas this April 5-7. Students will have the opportunity to participate in various competitions in robotics and circuits to represent OSU and network with IEEE members from across the region.

The chapter is very thankful for the new space in Engineering South and all the people that helped make it happen. Continuous support of the student chapter is appreciated with gratitude and the robust growth of the students towards professional careers, and OSU IEEE looks forward to what is to come.

### Student Activities: Eta Kappa Nu (HKN) News

Eta Kappa Nu (HKN) is the honor society of the Institute of Electrical and Electronics Engineers (IEEE). Oklahoma State University hosts the Omega Chapter of the nationally recognized organization. HKN at OSU is comprised of students majoring in electrical and computer engineering who are typically juniors, seniors, or graduate students. HKN members are known for their skills in leadership, teamwork, quality, and character. As an organization, HKN enjoys building a community amongst electrical and computer engineering students by incorporating a friendly environment to work together and events to serve the ECE student body.

The current officers include Jasmine Taplin (President), Kaylee Rolph (Vice President), and Madison Eulberg (Treasurer). The faculty advisor is Dr. Weihua Sheng. In the past year, HKN organized various events to recruit new members and serve the ECE community. HKN has partnered with the IEEE student chapter at OSU on several events, which include the presentation of an ECE Faculty of the Year award, future company facility tours, and PartEE. PartEE is an annual event in which ECE students come together to learn the basics of soldering along with understanding basic circuitry concepts. In the Spring 2023 semester, HKN designed



*HKN President Jasmine Taplin wearing the HKN T-shirt.*

t-shirts and sweatshirts for the ECE students on campus. This fundraiser was very successful and gave ECE students options for merchandise that supports the ECE department and promotes ECE majors. HKN is looking for new members. Juniors who are in the top 25% of their class and seniors in the top 33% of their class are eligible to join. For further inquiries regarding HKN, please contact [hknokstate@gmail.com](mailto:hknokstate@gmail.com)!



John O'Hara

## Taming the Terahertz for 6G Wireless Backhaul Dr. John O'Hara

Funding Agency: National Science Foundation

The National Science Foundation (NSF) has awarded an Early Career Development Program grant of \$500,000 to ECE assistant professor Dr. John O'Hara.

This prestigious award recognizes and supports early-career faculty with the potential to serve as academic role models in research and education, as well as to lead advancements within their department or organization.

Dr. O'Hara's research will focus on addressing several challenges that will emerge in next-generation (6G) wireless communication, particularly within the context of the backhaul link. The term "backhaul" refers to the high-bandwidth connection that swiftly transmits massive data quantities from numerous wireless and static communication sites to a core network. Traditionally, fiber optics have been the standard choice for backhaul implementation; however, there are situations where laying fiber becomes either prohibitively expensive or technically challenging. This is where wireless backhaul can provide a solution, but it must perform on par with fiber to be effective.

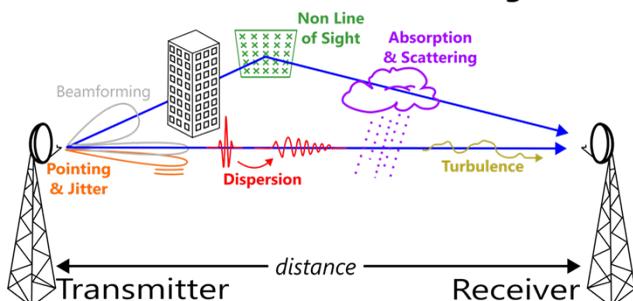
Next-generation 6G communication is set to meet these requirements, offering data rates of up to 1 terabyte per second. Achieving this immense capacity necessitates the use of terahertz frequency waves, as opposed to the traditional microwaves used in contemporary cellular networks. While numerous researchers have developed models to predict

the behavior of terahertz waves in long-distance backhaul links, there have been limited experimental validations and demonstrations. Dr. O'Hara's NSF project aims to bridge this gap, experimentally unveiling the intricate nature of various challenges such as beam jitter/alignment, group velocity dispersion, atmospheric inhomogeneities, wave scattering, and air turbulence.

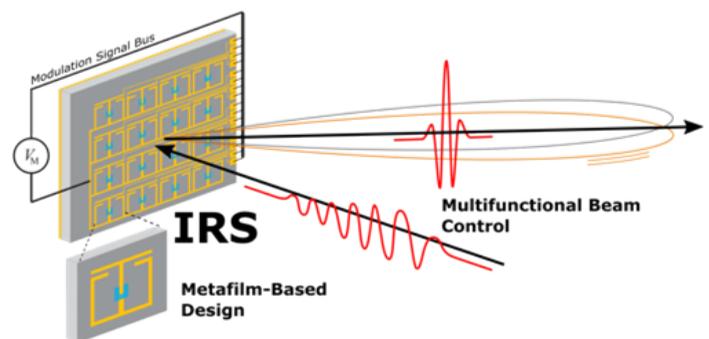
Moreover, Dr. O'Hara's research will explore methods and devices to address the hurdles of long-distance terahertz backhaul links, employing innovative devices known as "intelligent reflecting surfaces" (IRSs) to shape, steer, and correct terahertz beams. This groundbreaking project will capitalize on the existing capabilities of Dr. O'Hara's laboratory to explore the system architectures and channel models required for 6G communication systems. Simultaneously, he will engage in similar research endeavors funded by NASA, AFOSR, and other NSF grants.

While terahertz communication has been relegated to the realm of speculation for a considerable period, this work is anticipated to play a pivotal and foundational role in ushering in real-world terahertz wireless communication applications in the coming years. The likely specific application will involve providing high-speed network connectivity in temporary disaster areas, remote rural sites, transient facilities (such as mobile military hubs), and even permanent connectivity within densely populated urban areas.

### Terahertz Backhaul Challenges



Common challenges of the terahertz backhaul for wireless communications.



An intelligent reflective surface designed in Dr. O'Hara's lab for overcoming terahertz dispersion, a key challenge in the terahertz backhaul.

# RESEARCH HIGHLIGHTS



Hantao Cui

## PowerCyber: Computational Training for Power Engineering Researchers

Dr. Hantao Cui

Funding Agency: National Science Foundation

Dr. Hantao Cui, in collaboration with Dr. Xin Fang at Mississippi State University, was awarded \$180k from NSF Office of

Advanced Cyberinfrastructure. His project aims to develop a training program to bring advanced cyberinfrastructure to the power and energy research community.

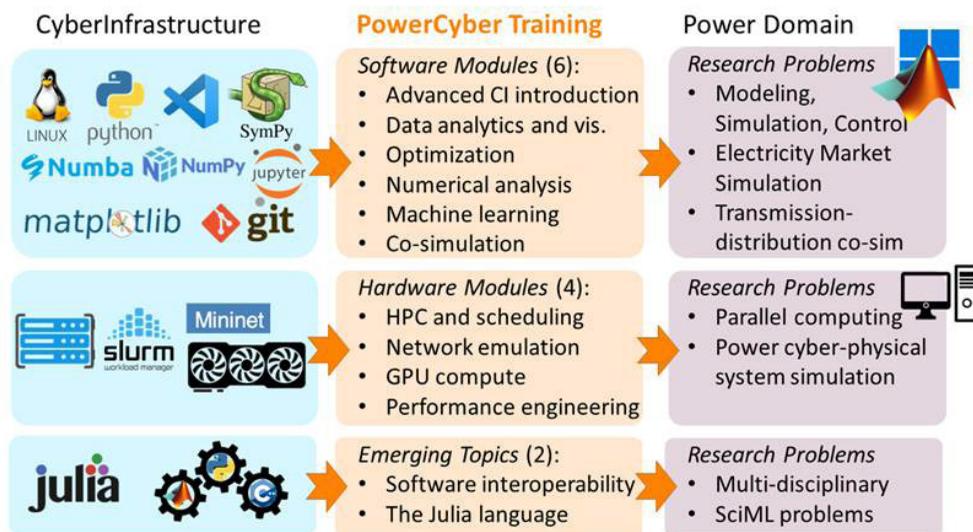
Electric power engineering, a discipline central to modern society, is characterized by highly complex networked systems. In recent decades, computer-based methods have been widely applied to the design, analysis, optimization, and control of modern power grids. These technical advancements in cyberinfrastructure (CI) have enabled new capabilities for power engineering research.

However, the integration of CI into power systems research necessitates the training of researchers for advanced CI adoption. Dr. Cui's research seeks to tackle three challenges that the power community is facing:

1. Inadequate Curriculum: The current curriculum has insufficient coverage of advanced CI, limiting student readiness to engage with anything beyond traditional tools like MATLAB/Simulink.

2. Closed-Source Tools: Education and research heavily rely on closed-source tools, which impedes the development of critical thinking and software ecosystems to solve complex multidisciplinary problems.
3. Lack of Educational Resources: There is a shortage of textbooks and training materials that bridge the gap between theoretical domain knowledge and its practical implementation using advanced CI.

To address these challenges, Dr. Cui's project has an ambitious goal: to equip the extensive research workforce in the power sector with the knowledge and skills needed to harness advanced CI. During the course of the project, Dr. Cui's team will develop an online, modular, and openly available PowerCyber training workshop to prepare power engineering researchers with a comprehensive understanding of advanced CI software and hardware. This project will have a broad impact on strengthening the nation's research workforce by streamlining the research initiation process in power engineering.



Common tools for computation power analysis included in the CyberTraining Pilot



John Hu

## Improving Undergraduate Debugging Skills and Mindset

Dr. John Hu

Funding Agency: National Science Foundation

Dr. Hu was awarded \$350k from the National Science Foundation EDU Core Research (ECR) program.

This project seeks to build his capacity in STEM Education Research by running pilot research on improving undergraduate debugging skills and mindset. It will also focus on professional development for educational psychology, quantitative methods, and study design.

Debugging is a critical aspect of troubleshooting, especially in the realm of integrated circuit (IC) development. With today's ICs becoming increasingly complex, largely driven by Moore's Law, it's becoming rarer for new chips to function perfectly right from the start. As a result, a significant amount of engineering effort is put into debugging, a process that identifies and fixes any discrepancies between the expected and measured chip behavior. Surprisingly, this essential skill is often overlooked in formal education, leading to potential challenges for students when they encounter real-world debugging scenarios.

The project aims to understand how to teach circuit debugging in undergraduate courses. Specifically, this project seeks to develop a training intervention program to improve undergraduate debugging skills. To accomplish this goal, Dr. Hu's team will first design a rigorous pilot study to infer a causal relationship and quantify how much a holistic and domain-specific debug training intervention improves undergraduates' circuit debugging skills and mindset. The cognitive portion of the intervention will

focus on teaching students common circuit issues and impart global debugging strategies, drawing from industry expertise and content. The affective component will include mandatory bug reporting and the offer of extra credit incentives for students who actively participate in constructing root cause tables. By incentivizing participation, the project aims to instill a proactive approach to debugging. The debugging mindset will be measured using established instruments. The debugging performance will be tested via custom-developed tools validated by industry experts.

In parallel to the research component, Dr. Hu will participate in an intensive professional development plan. This plan will expand his knowledge and skills in educational study design, quantitative methods, and educational psychology, further enhancing the project's outcomes.

The project holds the promise of numerous benefits, including:

- Enhanced employability and career prospects for students equipped with advanced debugging skills.
- Strengthened collaboration between academia and industry.
- Reduced debugging time and cost in new product development, thereby increasing efficiency.

By championing this initiative, Dr. John Hu is poised to empower a new generation of circuit developers with the skills and mindsets required to excel in the challenging world of IC development.

**Common Circuit Issues:**

1. Power/GND/pin-1
2. Connectivity (open, short)
3. Datasheet specs
4. Layout (Kelvin sensing)
5. Equipment setting
6. Loading effects

**Global Debugging Strategies:**

1. Exhaustive
2. Topographic
3. Functional

**Bug Reporting:**

Jack: V<sub>out</sub> is at 0V all the time. Shouldn't it be 10 \* V<sub>in</sub>?  
Reproducing conditions: xxxxx  
ticket #004

Bob: I ran into the same problem. The opamp's negative supply should be -15V instead of 0V.  
ticket #004

**Buggy Circuit Example**

Lab 4: Opamp  
DC: 0V  
AC: 1V

**Jack might be able to debug it by following this approach:**

1. Apply strategy #2: Topographic: split-half
2. Check R<sub>1</sub> and R<sub>2</sub>: is it in this half?
3. Check opamp: V<sub>DD</sub>? how about V<sub>SS</sub>? **Bug!**

**Root Cause Table**

1. Negative supply of opamp
2. yyyyy
3. zzzzz
4. uuuu

A buggy circuit example and the process of building of a root cause table.

# RESEARCH HIGHLIGHTS

## An intelligent Homecare System to Assist Older Adults

Dr. Weihua Sheng and Dr. Alex Bishop

Funding Agency: National Science Foundation



Weihua Sheng



Alex Bishop

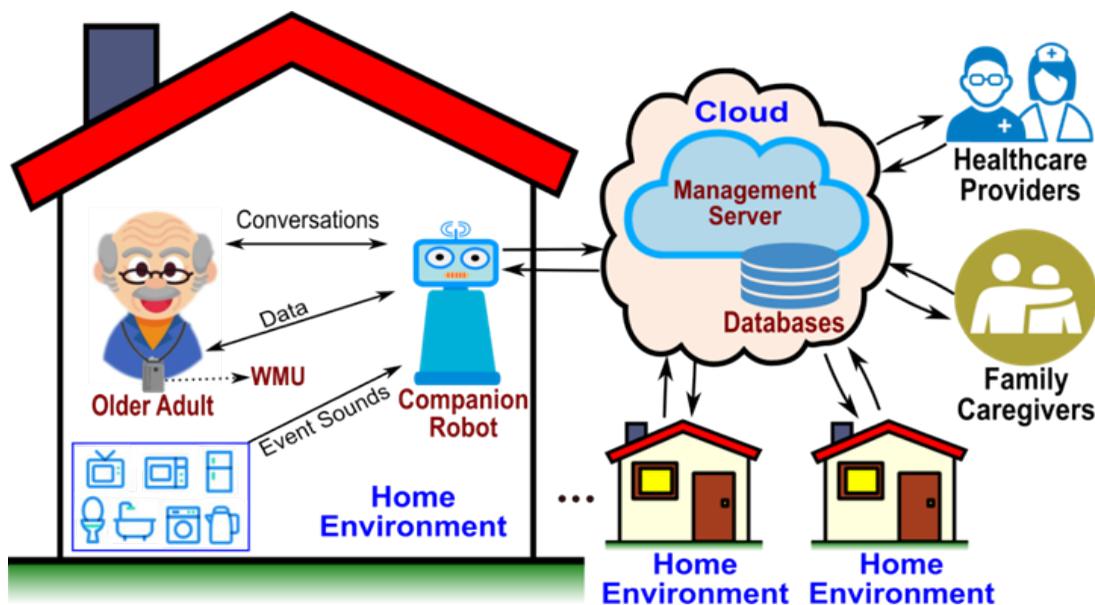
ECE professor Dr. Weihua Sheng, in collaboration with co-principal investigator Alex Bishop, professor in Human Development and Family Science, was awarded \$550k from the NSF Partnerships for Innovation-Technology Translation (PFI-TT) program. Their research project seeks to develop an intelligent homecare system (IHS) to assist older adults as they age in place, ultimately benefiting the growing

elderly population in the United States.

The proposed IHS is designed to monitor the well-being of older adults across various facets of life, including activities of daily living, physical and subjective well-being, and emergency situations. By fostering better connections between older adults and their caregivers and facilitating more efficient management of their daily life, the IHS will help bring peace of mind and reduce the cost of healthcare to family members. With a better tool for home healthcare, formal caregivers can enjoy improved productivity, reduced cost of operation and increased revenue.

In addition, this research will improve the educational environment at OSU in disciplines such as artificial intelligence (AI), robotics, embedded computing, and machine learning, as well as in non-STEM disciplines such as gerontology and entrepreneurship. The project will develop a prototype of the IHS and prepare it for commercialization.

The proposed work has several novelties. First, the IHS leverages its sensing capability and local AI to understand the daily activities of older adults, which provides the basis for health monitoring, intervention, and communication with caregivers. Second, the IHS assesses the physical and subjective well-being of older adults through anomaly detection and clinical interview. Third, the IHS proactively engages at-risk older adults to deliver timely interventions through health coaching and daily life management. Fourth, the IHS offers AI-assisted intelligent messaging and telehealth to connect older adults with caregivers, therefore promoting the socioemotional well-being of older adults. Finally, the IHS overcomes the psychosocial barriers by developing technologies for age-friendly human machine interface (HMI), learning and adaptation, and privacy protection.



The overall concept of the Intelligent Homecare System for elderly care.



Charles Bunting

## Using Statistics to Model a Brighter Future for Space Exploration

Dr. Charles Bunting and Dr. James West

Funding Agency: NASA

The laboratories at OSU managed by Drs. Chuck Bunting and James West recently completed a NASA STTR funded project for Robust Physics ([www.robustphysics.com](http://www.robustphysics.com)) to experimentally validate statistical models to predict the magnitude of an electric field within a reverberant environment.



James West

When spacecraft are in launch configuration, they are usually equipped with thermal-acoustic blankets for insulation. These blankets are now being adapted and augmented to guard against various electromagnetic threats, such as unintentional wireless emissions, onboard electronics interference, electrostatic discharge, and lightning. However, their deployment must be carefully optimized to prevent excessive weight, space consumption, and out-gassing risks, as well as to avoid compromising insulation and electrostatic charge conduction. Evaluating these design options requires statistical power balance modeling.

Their work assisted the company Robust Physics to validate a novel probability density function model. This new model was distinct from typical practices and its accuracy needed to be tested. They validated this model through an experimental setup that mimics a rocket payload fairing. This comprehensive model for electromagnetic energy power balance makes it possible to predict the mean electric field within complex enclosures featuring RF absorber materials.

The insights and findings from this research are poised to have a significant impact on the realm of space exploration. By providing a comprehensive and statistical approach to understanding and optimizing

the use of RF-absorbing blankets within spacecraft fairings, they move one step closer to ensuring the safety and security of the next generation of space missions.



An image of a simulated payload for satellite launch.

# ALUMNI AND CONTRIBUTORS

## CEAT Hall of Fame Inductee



*Craig Stunkel*

ECE alumnus Dr. Craig Stunkel was inducted into the CEAT Hall of Fame (HOF) on Oct. 21st, 2023.

Dr. Stunkel is a Stillwater native who graduated from Oklahoma State University with a bachelor's degree in electrical engineering in 1982. Dr. Stunkel then went on to receive a master's degree just a year later, in 1983 from OSU. After that, Dr. Stunkel accepted a job with IBM and moved to Rochester, Minnesota. He spent three years designing IBM System/38 computers before making the decision to continue his education. In 1990, Dr. Stunkel completed his doctorate from the University of Illinois, Urbana-Champaign. All his degrees had an emphasis on computer engineering.

Following completion of his Ph.D., Dr. Stunkel accepted a position with IBM Research in 1990 and devoted 30 years of avid leadership to the company, designing many high-speed networks for parallel and supercomputers. In 2020, Dr. Stunkel retired from IBM and joined NVIDIA, where he continues to focus on creating the highest-performing networks in the world.

To date, Dr. Stunkel has 19 U.S. Patents beginning in 1994 through 2021. He has 56 papers and three books/journal issues and has been recognized as a world-class expert in the interconnect area. Dr. Stunkel is an IEEE Fellow for his contributions to high-performance interconnection networks.

On the more personal side of Dr. Stunkel's life, he met his wife in the second grade at Stillwater's Westwood Elementary; they started dating when they were in junior high!



*Cameron Musgrove*

## ECE Alumni Spotlight: Cameron Musgrove

Cameron Musgrove is an Oklahoma State University (OSU) alumnus, who graduated with his Bachelor of Science degree in electrical engineering in 2005, his Master of Science in electrical engineering in 2007, and his Ph.D. in electrical engineering in 2015.

Musgrove's interest in science, technology and remote sensing is what led him to pursue an education in electrical engineering. As an undergraduate student, Musgrove was active in the OSU local chapter of the Institute of Electrical and Electronics Engineers (IEEE), serving as their president for one year. After graduating with his bachelor's degree, he decided to stay at OSU and complete his master's degree working under Dr. Chuck Bunting, who is now the Associate Dean of Research and Dr. Daqing Piao, Professor in the School of Electrical and Computer Engineering in the College of Engineering, Architecture and Technology (CEAT) at OSU, studying infrared tomography.

After completing his master's degree, Musgrove decided he was ready for the workforce.

In 2008, Musgrove started his career with Sandia National Laboratories in Albuquerque, New Mexico, working as a member of the Technical Staff with the Intelligence, Surveillance, and Reconnaissance (ISR) Analysis and Applications Department, working on Synthetic Aperture Radar.

"I learned a lot there very, very fast," Musgrove said. "I was testing air to ground communications systems for the radar system that I was working on and was learning all different aspects of the Synthetic Aperture Radar System."

In 2012, Musgrove decided it was time to continue his education to get his Ph.D. Being in Albuquerque, he was looking for a program that was completely online and OSU had just that in ECE. Working under Dr. James West, Professor of ECE at OSU, Musgrove focused his dissertation on Synthetic Aperture Radar Systems.

After completing his Ph.D. Musgrove stayed with Sandia, but changed his focus on radar analysis work, not just strictly Synthetic Aperture Radar. He became a Senior Member of the Technical Staff in the Radar and Signal Analysis Department where he was the Principal Investigator for internally funded research and development projects.

“I was leading more research and development projects,” Musgrove said. “I really liked those projects. When we have an idea, we simulate and make plans to build it. We first built it in the lab, then tested it in the field. Then we would repeat the loop. I really like that small program type of research and development type cycle.”

Musgrove stayed in that position for a year before he and his family decided they wanted to get back to Oklahoma. In 2017, Musgrove moved to Tulsa where he accepted a job at Williams, working as an Engineer III in the IT West Engineering and Project Management Department. There he led telecommunications technology and implementation practices across eight operational areas with a team of five technicians.

In 2019, Musgrove found an opportunity to work for IERUS Technologies as the Technical Lead for research and development projects by writing proposals for new research programs.

IERUS Technologies is a growing, technology-focused business established in the area of engineering, research and development, employing experts in electromagnetics phenomenology, analytical computing and weapon system engineering. IERUS Technologies is headquartered in Huntsville, Alabama, but has seven operating locations around the nation.

“At that time, remote work was kind of new, especially for the defense industry,” Musgrove said. “IERUS Technologies had a work culture that was amenable to remote work. They already had half a dozen people working across the country. I thought, why not give it a try, and it’s been great.”

In 2023, IERUS Technologies opened its first brick-and-mortar building in Tulsa, the first outside of Huntsville, and Musgrove became the Department Lead in the Advanced Techniques for RF Signal Processing Innovation Cell for this location.

“One of the reasons for opening up a brick-and-mortar in Tulsa was that IERUS found that there is a lot of competition for electrical engineers, mechanical engineers and engineering talent in the southeast region around Huntsville,” Musgrove said. “The thought was if they had some diverse locations, they could get some diverse talent across the country. There are several universities, such as OSU, and other regional universities that have really good engineering programs. If we could get people who want to stay in this general area, they could be attracted to this company.”

Musgrove has been with IERUS for five years working on a multitude of research and development projects. His work focuses on Small Business Innovation Research projects, special programs by the government to encourage small businesses to develop technology for defense.

“Reflecting on my career, I think that my national security work, working on the Copperhead program at Sandia, would be a highlight for me,” Musgrove said. “That particular system was used in the Afghanistan and Iraq wars. Ultimately, it was saving soldier’s lives. It was really a good feeling to participate in developing that system. I worked on things that really had a national impact - a direct measurable impact.”

The Copperhead program was initiated in 2008 to support the Joint Improvised Explosive Device (IED) Defeat Organization in Iraq and Afghanistan as an improvised explosive device detection sensor. The IED detections were used by the military to avoid critical injuries and deaths. Sandia received more than \$400 million in funding for the program since its inception. With troop reductions in Afghanistan and funding shifts, the program ceased operations on March 15, 2020.

Musgrove attributes his career success to a combination of several interactions throughout his time at OSU. He says “having cross-peer graduate student types of interactions was very beneficial for me. I was a research student working in Dr. Bunting’s lab for Dr. Piao’s research. Being in that lab group with different students, different disciplines prepared me for working in diverse cross-disciplinary teams. Writing my first research paper with Dr. Piao was also very important in terms of preparing me. It was difficult writing that first one, but it helped me do what I do today.”

To date, Musgrove has two Peer-Reviewed Journal Articles, “Replacing Missing Data Between Airborne SAR Coherent Image Pairs” and “Mitigating Effects of Missing Data for SAR Coherent Images”, both written with Dr. West, and has published an additional nine articles. He has also received eight patents.

Musgrove holds a membership with the Knights of Columbus and IEEE. He is married with three children and is actively involved in Boy Scouts.

# ALUMNI AND CONTRIBUTORS

## ECE Industrial Advisory Board

The mission of the ECE Industrial Advisory Board (IAB) 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.

Each member of the IAB has considerable experience in the private or public workforce as engineers, scientists, consultants, or managers. They represent a broad spectrum of industries and governmental laboratories and provide a healthy and diverse set of viewpoints and ideas. ECE is wholeheartedly grateful to the women and men of the IAB who volunteer their time throughout the year and offer their wise counsel to strengthen ECE's core programs.



*From left to right: Blaine Bunch, Billy Martin, Ken Butler, James Beauchamp, Ed Daniel, Todd Hiemer, Jack Graham, Jeffrey Young, Wendy Hammond, Mike Black, Wes Ray and Aaron Wiseman*

## NOTES AND NOTICES

### ECE Appreciates its Staff and Welcomes the New Ones



*Curtis Ross*



*Ryan Mouser*

The School of Electrical and Computer Engineering is delighted to introduce two new staff members to its team, Ryan Mouser and Curtis Ross, who bring diverse skills and experiences to enhance the department. Ryan Mouser, a former Senior Student Computer Technician, joins as the Lab Coordinator, having assisted with computer setup and technology troubleshooting in his previous role. He oversees laboratory support, technical training, IT support, and more, contributing significantly to the department's technical and instructional needs. Curtis Ross has a background in finance and work experience at Paycom and Sprouts Farmers Market. He takes on the role of Senior Accounting Specialist and manages ECE's financial records and invoices to ensure efficient financial management within the department.

As we welcome our new staff, it is equally important to acknowledge the invaluable contributions of our incumbent team members. Fransisca Bolin, Administrative Associate, handles payroll, finance, and accounting tasks, providing essential administrative support. Richard Prenzlow, Senior Administrative Support Specialist, assists faculty and staff with various responsibilities, from scheduling to travel arrangements, and plays a key role in departmental organization. Kristal Soderstrom Junkens, Senior Academic Advisor II with over 12 years of experience, is actively involved in professional development and community service. She is a dedicated member of NACADA – The Global Community for Academic Advising for 12 years and has held significant roles within the organization, including Region 7 Chair (2021-2023). Kristal is also set to join the Annual Conference Advisory Board (2023-2025).



*Richard Prenzlow*



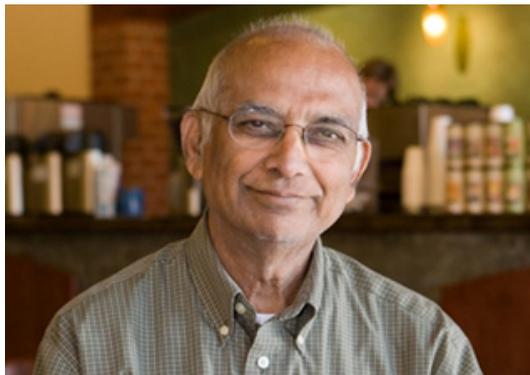
*Fransisca Bolin*



*Kristal Soderstrom Junkens*

Together, these dedicated individuals, both new and incumbent, form a dynamic team within the School of Electrical and Computer Engineering. Their combined skills and commitment ensure that the department continues to excel in its mission of providing high-quality education and research opportunities for students and faculty alike.

### **ECE mourns the loss of Dr. Yarlagadda**



*Radha Krishna Rao Yarlagadda*

Emeritus Regents/Centennial Professor Dr. Radha Krishna Rao Yarlagadda joined the School of Electrical Engineering on September 1, 1966. In 1989 he was named an OSU/Centennial Professor. After 40 years of continuous employment, he retired on June 1, 2006. He passed away on February 27, 2023.

Dr. Yarlagadda led a distinguished 40-year career as a researcher. As an acknowledged pioneer in the field of digital speech processing, his work yielded commercial and academic successes that have defined the discipline, particularly in seismic signal processing for well logging and oil exploration applications. His signal processing research was also in great demand by the National Security Agency.

Dr. Yarlagadda was celebrated as a Fellow of the Institute of the Electrical and Electronics Engineers (IEEE), which is the largest professional technical organization in the world with over 400,000 members. In addition to his research and grants, he authored several seminal books including *Analog and Digital Signals and Systems* (which is now in its 2nd printing in China). He also co-authored three textbooks that continue to guide students in electrical and computer engineering.

He was widely recognized as a quintessential professor in the Oklahoma State University School of Electrical and Computer Engineering (ECE). His proudest professional achievements were the thirty Ph.D. students that he mentored, many of whom have achieved unquestionable success in industry, government, and academia. They count themselves among his extended family and could not have asked for a better advisor and dear friend.

Upon retiring from teaching, Dr. Yarlagadda turned his efforts to writing; he published *The Life in the Eyes of Thatha* (grandfather in his native language of Telegu), a book of grandfatherly wisdom he wanted to share with the world.

Dr. Yarlagadda was born in Velpucherla, Andhra Pradesh, India and moved to the United States in 1960. He earned his degrees in Electrical Engineering from South Dakota State University (MSEE, 1961) and Michigan State University (Ph.D., 1964). He married his lifelong love, Marceil in 1966 and soon joined OSU thereafter.

As mentor, colleague, and friend, he will be deeply missed by the ECE community.

## NOTES AND NOTICES



### ECE Advisor Receives Global Award

Kristal Soderstrom Junkens has earned recognition for her commitment to ECE students, receiving the prestigious NACADA Global Award – Outstanding Advisor Award – Primary Role Category, Certificate of Merit in 2023. Her extensive experience and contributions make her a valued member of the ECE family.

*Kristal Soderstrom Junkens*

### James West – A Strong Finish



*James West*

After 34 years at OSU, Dr. James “Jim” West, professor of electrical and computer engineering, is retiring from OSU. Over the course of his career, he has mentored seven Ph.D. students and twenty M.S. students. He made key contributions to electromagnetics scattering phenomena, computational electromagnetics, antenna design, remote sensing, and statistical methods as evidenced by his 42 journal publications and 94 conference proceedings. In addition to his work at OSU, he was a visiting scientist at the Naval Research Laboratory (August 1998- July 1999) and a summer faculty fellow at the Air Force Research Laboratory (1994, 1995, 2007), Sandia National Laboratory (2011) and NASA Goddard Flight Center (1991).

Approximately 22 years ago, Jim and Dr. Charles “Chuck” Bunting created the Robust Electromagnetic Field Simulation and Testing (REFTAS) Laboratory by merging Jim’s strengths in computational and statistical electromagnetics with Chuck’s strengths in experimental methods. Their work in reverberation chamber measurements and EMC phenomenon is particularly noteworthy. They also collaborated on course development in RF, microwaves, and electromagnetics (EM) for both graduate and undergraduate education. Jim’s partnership has enabled the REFTAS lab to secure significant grants from FAA, Sandia, AFRL, ONR, NASA, NAVSEA, and NSF.

Jim’s strong background in radar, novel broadband antenna development and moment method software development for determining sea surface scattering led to particular success in predicting unexpectedly strong radar returns from horizontally polarized low grazing angle microwave scattering from breaking water waves. Jim is a methodical researcher with a deep intuition for the underlying physics of the engineering application.

Jim’s insights, depth of experience and technical ability were recognized by receiving the 2022 IEEE EMC Society Technical Achievement Award. In the supporting nomination, Jim was referred to as a “notable quiet achiever in EMC”. In two separate EMC Transactions papers Jim reported two significant technical achievements which are now being recognized for their contributions to the state-of-the-art. In the first he introduced an efficient reciprocity formulation for the numerical modeling of coupled interactions between deterministic conductor fields and a reverberant field that can only be described statistically. This reciprocity formulation is many times more efficient than Monte Carlo approaches currently used by most other researchers in the field. In the same two papers, Jim then goes on to make a second very significant contribution to the field of EMC. He showed that the probability distribution (e.g., maximum expected level) of a conductor current in a reverberant field is only a simple Rayleigh distribution for continuous wave excitation, but that the correct distribution for a more general “frequency stirred” response can be predicted if the frequency-dependent, free field radiation impedance of the conductor is known (or can be estimated). These are foundational research findings that (together with other breakthroughs by contemporary researchers) have enabled the development of a robust, statistically reduced-order modeling process that enable quantitative EMC design in advance, test-based EMC qualification.

In addition to Jim’s research contributions, he was a dedicated teacher whose door was always open to ECE students. Student comments like the following were not uncommon:

*“Dr. West is a fantastic teacher, and I really enjoyed this class. The way he teaches give us a very in-depth understanding even though the material is difficult”,*

*“Dr. West has been one of my favorite professors .... He does a fantastic job lecturing while answering students’ questions and tying concepts together in a cohesive way”*

*“Dr. West's calling is teaching. ... He walked us through each calculation in fine detail and his examples were great at demonstrating the concepts. This was far and away my favorite course.”*

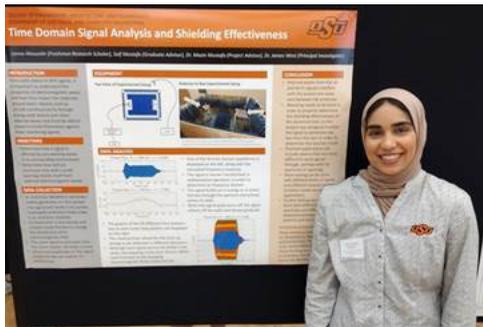
Jim’s exemplary teaching was recognized by receiving the Eta Kappa Nu (HKN) Outstanding E.E. Instructor Award three different times.

Oftentimes Jim would take on an extra teaching assignment simply because the need existed in the department. Although electromagnetics was his primary expertise, he also volunteered to teach senior design and random signals.

One of Jim’s enduring qualities was his avoidance of the spotlight. He worked countless hours during evenings and weekends in service to his profession and to ECE. Whenever a critical task had to be performed for ECE, Jim would typically say “yes” when asked to do it. When he chaired ECE search committees, personnel committees, and ABET assessment committees, he did so with great care and diligence.

Jim leaves a legacy of technical excellence, dedicated teaching, and sacrificial service to ECE. As he starts this new chapter of his life, the impact of his academic profession will continue to resonate with his students and colleagues.

## ECE Celebrates Undergraduate Research Engagement



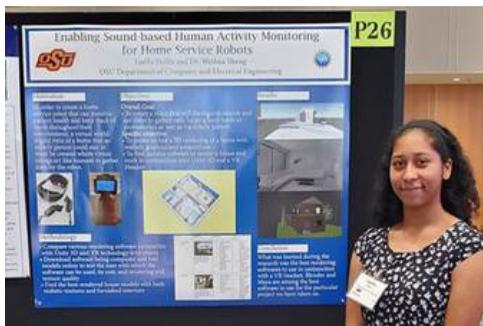
Lena Abouzahr

In our latest newsletter, we highlight the impactful Freshman Research Scholars program at OSU, providing students with an extraordinary opportunity to extend their education beyond the classroom through immersive research experiences guided by innovative faculty researchers. The Robberson Trust generously awards each Freshman Research Scholar with a \$1,000 scholarship, further bolstering their academic pursuits.

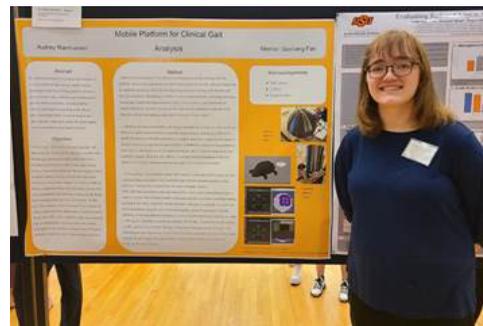


Caleb Blackwell

This year, several exceptional ECE students and their dedicated mentors showcased their research accomplishments at the 2023 Freshman Research Symposium held on April 13. Lenna Abouzahr, explored "Time-Domain Signal Analysis" under the mentorship of Dr. James West. Audrey Rasmussen, investigated "Mobile Platform for Clinical Gait Analysis" under the guidance of Dr. Guoliang Fan. Caleb Blackwell focused on "Power Grid Modernization" with Dr. Hamidreza Nazari-pouya as his mentor. Additionally, ECE faculty extended their expertise to the School of Architecture, as exemplified by Luella Hollis, whose research centered on "Enabling Sound-Based Human Activity Monitoring for Home Service Robots" under the mentorship of Dr. Weihua Sheng. These outstanding students and mentors continually drive innovation and make meaningful contributions to their respective fields of study.



Luella Hollis



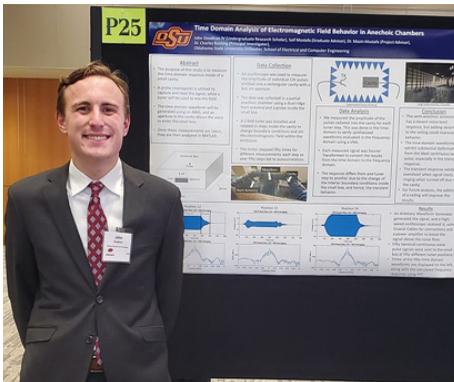
Audrey Rasmussen

# NOTES AND NOTICES

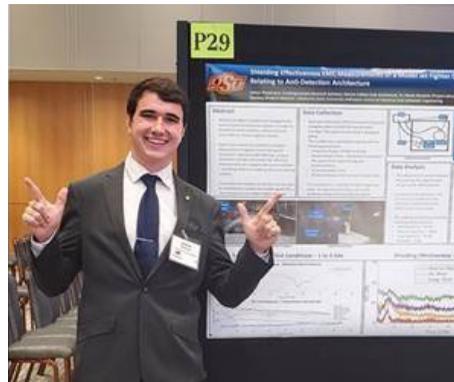
## ECE Celebrates Undergraduate Research Engagement (cont.)

On April 18, 2023, OSU proudly hosted its annual Undergraduate Research Symposium at the ConocoPhillips Alumni Center, providing a platform for OSU's brightest minds to showcase their remarkable research. Three exceptional ECE students presented their profound insights and discoveries, cultivated through dedicated research efforts guided by ECE faculty mentors. This event underscores OSU's commitment to fostering a culture of research and innovation, where students explore and push the boundaries of knowledge. The ECE department takes pride in acknowledging and celebrating the achievements of these promising young researchers.

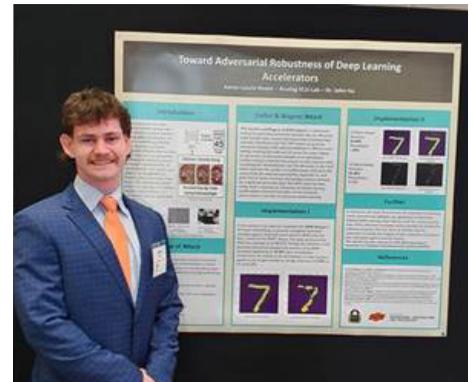
The presentations by these ECE students spanned a diverse range of topics, illustrating the department's commitment to cutting-edge research and technological advancement. John Doudican IV delved into the electromagnetic realm with his presentation on "Time Domain Analysis of Electromagnetic Field Behavior in Anechoic Chambers," guided by Dr. Charles Bunting. James Boudreaux investigated aircraft design with his research titled "Shielding Effectiveness EMC Measurements of a Model Jet Fighter Cockpit Relating to Anti-Detection Architecture," with Dr. Charles Bunting as his mentor. Aaron Laszlo Rosen focused on deep learning accelerators with his presentation "Toward Adversarial Robustness of Deep Learning Accelerators," reflecting the department's dedication to advancing technology security and reliability. Dr. John Hu played a pivotal role in guiding Aaron through this intricate research landscape.



John Doudican



James Boudreaux



Aaron Laszlo Rosen

OSU's annual Undergraduate Research Symposium celebrated academic excellence, research prowess, and collaborative spirit within the ECE department. It served as an inspiring beacon, emphasizing the university's dedication to nurturing the next generation of innovators and thoughtful leaders in electrical and computer engineering. These remarkable students and mentors have contributed valuable insights to their respective fields, setting the stage for even greater achievements in the future.

## ECE Opens Their Doors in New Historical Engineering South



Engineering South, a historic building on the Oklahoma State University (OSU) campus, opened its doors again after a much-needed remodel. On Saturday, September 2, 2023, CEAT held a Grand Opening and Ribbon Cutting ceremony to commemorate the new home of the School of Electrical and Computer Engineering (ECE).

The building, which originally opened in 1939, has been under renovation since June 2021.

In the history of OSU, there have been only three buildings originally dedicated to engineering that predate Engineering South: the first Engineering Building, completed in 1902; the Civil Engineering building, completed in 1905; and the second Engineering Building, completed in 1912.

All were constructed based on the needs of a growing student body and quickly advancing technical curriculum. Between 1908 and 1912, degrees granted in engineering at OSU exceeded those in any other field. The second Engineering Building was the first to house all four branches of engineering curriculum that had been established by OSU: architectural engineering, civil engineering, electrical engineering and mechanical engineering. It also provided drafting rooms, laboratories and classrooms.

In 1939, the federal government provided 45% of the funding for a new Engineering Building at OSU through the Public Works Administration program.

It was the perfect time for the new Engineering Building (Engineering South today) to open for classes. All the engineering departments, except for architecture, moved from the 1912 Engineering Building (now called Gundersen Hall).



*The good old days in Engineering South*

Although Engineering South was much needed, OSU would quickly learn that it would have to stay cognizant of the needs of the engineering college to stay at the forefront of innovation.

In 1948, the engineering branches had combined to form the Oklahoma Institute of Technology (the precursor to the College of Engineering, Architecture and Technology— not to be confused with OSU Institute of Technology in Okmulgee, which was called the OSU Technical Branch at the time).

The Oklahoma Institute of Technology consisted of three divisions focused on engineering instruction; engineering research, including an experiment station; and engineering and industrial extension. The Division of Engineering Instruction consisted of a School of Engineering (that now included additional branches in industrial engineering and management, agricultural engineering, and chemical engineering), a School of Architecture and Applied Arts, a School of Technical Training and a School of Flight.

By 1951, Engineering South was struggling to meet the demands of the quickest growing college on campus.

The total enrollment in the engineering division reached 3,240 students that year, more than 10 times the number of students enrolled only three years prior.

Due to lack of space, the School of Chemical Engineering found itself in a temporary accommodation in a Quonset hut, which was acquired from military war surplus stocks. Through 1951, the Division of Engineering was relying heavily on Engineering South to support its needs.



In the hopes of gaining some breathing room, Dean Melvin R. Lohmann strongly encouraged then OSU President Oliver Willham to allow him to put a basement space in Engineering South.

Willham agreed and Lohmann increased the capacity of the building by 25%. Engineering South continued to serve the brunt of the Division of Engineering's needs until Engineering North was constructed in 1964.

Engineering South offers glimpses of CEAT's historic past, such as the large monument to engineering honor society Sigma Tau on its northern lawn, which

## NOTES AND NOTICES

### ECE Opens Their Doors in New Historical Engineering South (cont.)

was placed in 1940 to commemorate the chapter that was active from 1923 to 1974; and the aerial towers that grace its roof that were used to support the W5YJ ham radio station as well as several other campus radio stations, which featured programs like the immensely popular “Farmers Hour.”

Since its completion 84 years ago, Engineering South has served as a staple of CEAT, but 84 years without a major renovation had begun to show.

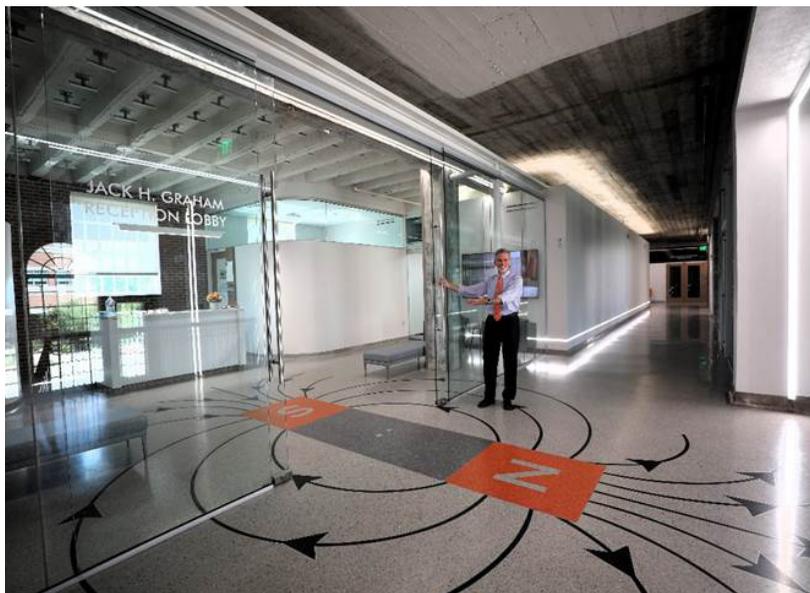
“I believe the common frustration that everyone — visitors, faculty, staff and students alike — had with the prerenovated Engineering South building was the fact that the men’s and women’s restrooms were on alternating floors,” said Dr. Jeffrey Young, department head of the School of Electrical and Computer Engineering. “The ventilation system was also from the early days, so there were no heating and cooling zones. The building was centrally heated and cooled on each floor, so sometimes one office was hot while another was cold. It was hard to make the space comfortable for most everyone. There wasn’t much to get excited about. There were a lot of dark hallways and closed doors.”



Classroom sizes were also a constant struggle. Many of the classrooms were not large enough to accommodate today’s enrollments. They also featured outdated furniture and equipment.

In June 2021, construction began on the structure, as it joined a plethora of CEAT’s newly renovated and constructed buildings, including its twin in Engineering North.

While the exterior facade of Engineering South remains intact, the interior of the building has been completely transformed into the innovative environment needed for ECE faculty, staff and students to be on par with the quickly advancing world of modern engineering. Parts of the original Engineering South remains. One of those pieces being the central grand staircase, which leads individuals to the main entrance of ECE.



“Those stairs represent a connection to the generations of engineers who came before, those engineers who learned both the basics of engineering as well as the specific knowledge of their chosen discipline in this building,” said Dr. John Veenstra, interim CEAT dean. “How many times during their academic career did the typical engineering student climb those stairs to get to the large lecture hall on the third floor? Then they went out into the world and used that education to accomplish amazing things that have benefited Oklahoma, the nation and the world.”

Aside from the grand staircase, the Zodiac, the central Palladian window and a few other original interior features such as original beaming, portions of concrete and brick wall

that were smartly factored into the overall transformation of the building; not much of the original interior is left.

This fall, Engineering South again opened its doors to another class of future engineers, architects and technologists, but this time it has a state-of-the-art HVAC system, adequately sized classrooms and elevators, and universal restrooms on every floor.

It features more glass walls, allowing natural light from the windows to stream in, and elevated ceilings, which makes the building feel more voluminous. Each floor of the building features its own unique architectural customizations, designed to meet the needs of the school or department occupying that floor.

“For the first time ever, ECE has spaces that allow faculty and staff to seamlessly work together in contiguous offices and meeting rooms on one floor, instead of being in basements as in the past,” said Young. Students have their own signature lounge in a highly visible space. Faculty, who used to be dispersed among four different floors within Engineering South, now work side-by-side with breakout rooms conveniently located near their offices. I think with the renovation, people are going to say “I want to be here”.”

“I especially enjoy the well-equipped conference rooms that serve as a great hub for research meetings and team building,” said Guoliang Fan, Professor of ECE. “The new building truly fosters a student-centric community by reducing the distance between faculty and students and promoting interaction among them.” Students can find the CEAT Scholarships and Recruitment team, CEAT Career Services and CEAT Special Programs on the first floor and an addition on the east side of the building houses the Zink Center for Competitive Innovation. The east addition also houses the 207-seat Chickasaw STEM Auditorium.

“Engineering South’s renovation has been a definite improvement to OSU’s engineering spaces overall and has made a huge impact on where I spend my time on campus,” said Mason Adams, a senior in ECE. “The new ECE student lounge on the second floor has turned into a great space to meet for projects or get homework done. The building just feels more modern. It’s nice to have a centralized place to visit my professors and advisors; I can visit my advisor, go to office hours, and swing by the Diversity, Equity and Inclusion office without having to leave the building, which is much better than the spread of rooms and buildings we had before.”

The multimillion-dollar project has been a small price to pay for a building that has meant so much to CEAT for almost a century.

“ECE has been quite fortunate to have alumni and friends who believe in our mission of teaching and research,” said Young. The ES project could not have been realized to its fullest without their significant financial support. I am truly amazed by and thankful for their generosity.”



## NOTES AND NOTICES

### By the Numbers

#### SCHOLARSHIPS

**126** Scholarship offers to ECE students

**\$291,200** Offered by ECE in 2021

**120**

New Freshmen,  
Fall 2021

**48,261**

Scopus  
Publication  
Citations

**\$5,735,028.47**

FY23 Research Grant Awards

**20.1** H-Index  
(Average)

#### 2023 PUBLICATIONS

**57**

Journals

**34**

Conferences

**\$2,797,705.40**

In Expenditures

**\$11,432,168.77**

Grants Under  
Management

#### 2023 ENROLLMENTS

**237** BSEE

**10** MEngEE

**14** MSEE

**184** BSCpE

**39** PhD

#### 2023 GRADUATIONS

**53** BSEE

**3** MEngEE

**3** MSEE

**32** BSCpE

**2** PhD

## ECE HEAD COUNT

**9** Professors

**6** Assistant Professors

**2** Associate Professors

**5** Staff

**1** Assistant Professor of Practice

## PROFESSIONAL SOCIETY FELLOWS



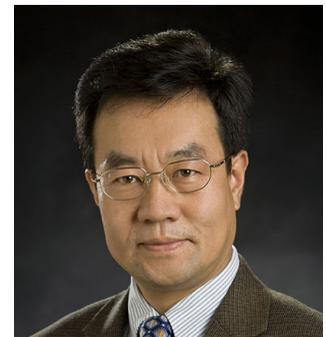
**Chuck Bunting**  
IEEE



**Gary Yen**  
IEEE



**Jeffrey Young**  
IEEE



**Weili Zhang**  
OSA

**OSU REGENTS  
PROFESSOR**

## ENDOWED CHAIRS, PROFESSORSHIPS, AND FELLOWS



**Chuck Bunting**  
Bellmon  
Chair



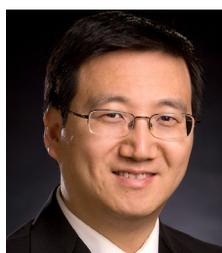
**James Stine**  
Joullian  
Chair



**Jeffrey Young**  
OSURF  
Chair



**John Hu**  
Jack  
Graham  
Fellow



**Guoliang Fan**  
Vogt  
Professor



**John O'hara**  
Naeter/  
PSO  
Professor





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