POINTS OF PRIDE

Ohio State's ECE department **ranks 22nd among graduate programs** listed in *U.S. News and World Report* (2021).

$ 19.5 MILLION

Ohio State ECE research expenditures in the 2019-2020 academic year

27	58	7	5	3
FACULTY IEEE FELLOWS	TENURE-TRACK FACULTY MEMBERS	RESEARCH-TRACK FACULTY MEMBERS	CLINICAL-TRACK FACULTY MEMBERS	ASSOCIATED FACULTY MEMBERS

DEGREES CONFERRED

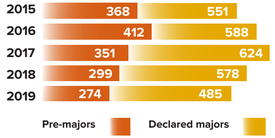
45 Ph.D.

116 Master's

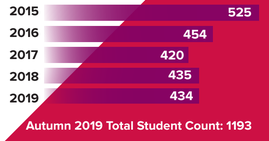
248 Bachelor's

Summer 2019-Spring 2020

UNDERGRADUATE STUDENTS



TOTAL GRADUATE STUDENTS



Autumn 2019 Total Student Count: 1193

GRADUATE ENROLLMENT

	Ph.D.	MS
Total Number of Graduate Students	242	193
New Applicants	300	858
Number Admitted	46 (15.3%)	131 (15.3%)
Number Enrolled	35	98
Average GRE (quantitative)	164 (89 percentile)	165 (88 percentile)

ECE graduate program admission rates are less than 20%. Students in our Ph.D. program averaged 87th percentile GRE quantitative scores.

12,136
Ohio State ECE alumni worldwide

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

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ECE/IMR Communications Specialist

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Department of Electrical & Computer Engineering

ANNUAL REPORT 2019

EDUCATE
RESEARCH
LEAD
INNOVATE

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Climate Science Research

MOSAiC: Into the Arctic

"I didn't expect it to be so cold," **Oguz Demir** said, laughing. "Yeah, it was supposed to be cold, but I really felt how it hurts you when it's below 30 degrees Celsius. I'll never forget that."

A graduate student in electrical and computer engineering (ECE) at The Ohio State University, Demir returned this month from a once-in-a-lifetime international expedition to the Arctic in the name of climate science.

Arctic travel may not seem an obvious path for ECE, but it also reveals how broad the major and opportunities are at Ohio State for students.

During autumn semester, Demir joined 600 scientists from 17 countries living on a ship frozen into the Arctic sea ice; braving adverse weather, months of darkness, cracks that split their camp in two, all while keeping a watchful eye out for the occasional polar bear.

For Demir, the memories range from laughs to somber head shakes.

"We were exploring some part of the world as if no one had ever discovered it," he said. "It was like the surface of the moon. That motivated me. Not many people see this environment. It's special. It's beautiful. I felt lucky."

The Multidisciplinary Drifting Observatory for the Study of Arctic Climate mission, or MOSAiC, houses researchers collecting an unprecedented amount of data to take climate and ecosystem research to the next level. The endeavor is spearheaded by the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI). The National Science Foundation funded Ohio State's research proposal to operate an ultrawide band radiometer to estimate sea ice thickness and salinity.

Demir represents the Ohio State team, led by ECE Professor **Joel Johnson**, whose research at the ElectroScience Laboratory has already tested Earth science instruments over Greenland and successfully launched NASA satellites to study soil moisture, radio frequency interference, weather, as well as ice coverage worldwide.

Demir said the MOSAiC instrument is working well, despite some major setbacks. At one point a strong Artic storm hit the area, cracking the ice beneath them; literally dividing the camp into two pieces.

"No one even expected that would happen," Demir said. "Luckily, it stopped drifting and it actually came 100 meters back."

Read more online:
https://go.osu.edu/demir-story

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Instagram | **ohiostateece**

FACULTY

New Appointments | 2019

Mariana Pereira Costa Pulcherio, joined ECE as a Lecturer in 2018. She previously earned her Ph.D. in electrical engineering at Ohio State with a focus on microgrid systems.

Kiryung Lee joined as an Assistant Professor in 2018. His research interests include inverse problems and optimization in signal processing and statistics, as well as applications in engineering, neuroscience, and psychology.

2020: Ohio State ECE State of the Department Address

The Ohio State University's Electrical and Computer Engineering (ECE) program held its first virtual State of the Department Address for alumni, amidst the ongoing international work-from-home experiment caused by the COVID-19 pandemic.

ECE Chair Hesham El Gamal spoke on coronavirus concerns and department changes via Carmen Zoom the evening of March 26 to remote faces of alumni across the United States. He also touched upon good news regarding department rankings and a strategy for the unknown future. In this time of dealing with such changes, El Gamal said, universities which figure out innovative pathways forward will come out ahead. He said ECE faculty, lecturers, students and staff were forced to entirely redefine what they do overnight – and they rose to the challenge.

Find a recap story and video at the link:
https://go.osu.edu/2020sotda-story

SELECTION OF ECE AWARDS & HONORS

FACULTY

- Associate Professor **Hongping Zhao** won a $600,000 U.S. Department of Energy project, "High efficiency InGaN Light emitting diodes emitting green, amber and beyond," to pursue innovative residential and commercial building technologies for energy efficiency.
- Professor **Steven Ringel** was named an IEEE Fellow for contributions toward the advancements in compound semiconductor photovoltaics.
- Professor **Marvin White's** influential work in engineering earned the Pioneering Achievement Award at the 2019 International Image Sensor Society conference.
- **Sanjay Krishna**, George R. Smith Chair in Engineering and ECE Professor, earned the 2020 SPIE Aden and Marjorie Meinel Technology Achievement Award for his pioneering work and impact in infrared technology.
- Research Scientist **Eric Walton** won the Honorary Life Membership Award at the 41st Annual Symposium of the Antenna Measurement Techniques Association.
- Professor **Emre Koksal**, was named "Inventor of the Year," by Columbus Business First.
- Spring 2019 Outstanding Teaching Assistants included **Khalid Alkhalid** as well as **Chenyu Liang**.
- The team of **Hongping Zhao**, **Siddarth Rajan**, **Jin Wang** and **Steven Ringel**, won a $2.2 million transformational energy project grant.
- Professor **Paul Berger** joined the IEEE Electron Devices Society Board of Governors.

STUDENTS

- **Mia Zhang** was named a 2019 Undergraduate Student Pelotonia Fellow.
- **Daniel Lepkowski** won first place in the 2019 John D. and Alice Kraus Memorial Graduate Student Poster competition. The second place winner was **Lucas Newton**, and the third place winner was **Tyler Nagy**.
- **Seckin Sahin** won the Ohio State Graduate School Presidential Fellowship.
- **Blaine Miller** won an APTIV scholarship.
- **Andreas Fiedler** and **Nicole Pfiester** were named 2019 Ohio State Presidential Postdoctoral Scholars.
- **Katrina Guido** won a 2019 National Defense Science and Engineering Graduate Fellowship Award, as well as the Best Paper Award at the Chronic Brain Injury Research Day. She also attended the National Institutes of Health BRAIN Initiative Summer Course.
- The Ohio State EcoCAR team won first in the national Mobility Challenge Year One Competition.
- **Brett Ringel** and **Rudy Fink** won the Richard J. and Martha D. Denman Undergraduate Research Forum at Ohio State.
- Alumnus **Wesley Thio** won Ohio State's 2019 Next Generation Innovator of the Year award.
- **Nidhin Kurian Kalarickal** won "Outstanding Student Paper Award" at the 2019 North American Conference on Molecular Beam Epitaxy.

Get involved: EE/ECE Alumni Society
https://ece.alumni.osu.edu

EE/ECE Alumni Society

RESEARCH & OUTREACH

Facial expressions don't tell the whole story of human emotion

Interacting with other people is almost always a game of reading cues and volleying back. We think a smile conveys happiness, so we offer a smile in return. We think a frown shows sadness, and maybe we attempt to cheer that person up.

But facial expressions might not be reliable indicators of emotion. In fact, it might be more accurate to say we should never trust a person's face, new research suggests.

"The question we really asked is: 'Can we truly detect emotion from facial articulations?'" said **Aleix Martinez**, a professor of electrical and computer engineering at The Ohio State University. "And the basic conclusion is, no, you can't," he said.

Martinez, whose work has focused on building computer algorithms that analyze facial expressions, and his colleagues presented their findings Feb. 16 at the annual meeting of the American Association for the Advancement of Science in Seattle.

The researchers analyzed the kinetics of muscle movement in the human face and compared those muscle movements with a person's emotions. They found that attempts to detect or define emotions based on a person's facial expressions were almost always wrong.

"Everyone makes different facial expressions based on context and cultural background," Martinez said. "And it's important to realize that not everyone who smiles is happy. Not everyone who is happy smiles. I would even go to the extreme of saying most people who do not smile are not necessarily unhappy. And if you are happy for a whole day, you don't go walking down the street with a smile on your face. You're just happy."

It is also true, Martinez said, that sometimes, people smile out of an obligation to the social norms. This would not inherently be a problem, he said — people are certainly entitled to put on a smile for the rest of the world — but some companies have begun developing technology to recognize facial muscle movements and assign emotion or intent to those movements. ■

Read more online:
https://go.osu.edu/amemo
Story by: Laura Arenschield

Stardust and Ohio State's next-gen electric machine

A mineral found in stardust helped electrical engineers at The Ohio State University win a large-scale, $3.7 million, power efficiency project sponsored by the United States Department of Energy (DOE).

"The dream system now is in front of us," said **Longya Xu**, director of Ohio State's Center for High Performance Power Electronics (CHPPE). "We have operated the system. It does reach the goal."

The world market for medium voltage electric motors is growing fast. They are the backbone of international industry. Power systems for oil and gas companies, refineries, or water treatment facilities all require a range of fans, pumps, compressors, grinding mills, metal rolling, and hoists in order to get results.

Ohio State was among five winning teams earning DOE funding to develop the next-generation electric machines and drives. Buckeye researchers see the value in pursuing the most efficient systems.

Electrical and Computer Engineering (ECE) professors Xu and **Jin Wang**, along with Assistant Professor **Julia Zhang**, make up the Ohio State team to create the first next-generation, silicon carbide-based medium voltage megawatt level converter -A 7 kV, 1 MVA SiC based Modular Multilevel Converter, or MMC. It paves the way for an efficiency increase of 30 percent. ■

Watch a video online:
https://go.osu.edu/chppemmc

Photo Captions: **1.** Aleix Martinez and his team. **2.** Prof. Longya Xu at CHPPE **3.** Prof. Sanjay Krishna in his office **4.** Prof. Paul Berger with Tanzanian class **5.** NASA image of the CubeRRT launch deployment

Pitch: Entrepreneurial Engineering

Engineering students hoping to become the next Steve Jobs can wind up their tech pitches now at The Ohio State University.

After navigating careers in academia, and owning a successful startup company for nine years, ECE Professor and George R. Smith Chair **Sanjay Krishna** initiated a new course for students called, "Empowering the Entrepreneur Engineer."

"I feel there is a need right now. Not every Ph.D. student wants to become faculty. As the marketplace is changing, the demands on the current engineer are also changing. A lot of them want to start their own company," Krishna said. "The basic idea of this course is to teach our engineering students the concept of entrepreneur-minded learning. You have an idea? Is it a business idea? Is there a market? What is capital and how do you raise it?"

Krishna wants students to come up with their own startup ideas and present them to the class, asking questions like, "What does the customer want?" or "What does the customer need?" ■

Full story and video:
https://go.osu.edu/pitch-eee

Harnessing the gift of light for Tanzanian orphans

Engineering students and faculty gave the gift of sunshine this year to help empower an orphanage in Tanzania.

Happiness Wambura, matriarch of the Camp Joshua School for Children, said Ohio State's Solar Engineering and Outreach Service-Learning (SOLAREO) in Tanzania Project took the students out of the dark – spiritually and literally.

"The work done by the Ohio students made a very big impact into the lives of children," she said. "They put light in the dormitory and in their lives. Light in every corner."

When night falls in Africa, newly-installed solar LED lighting now helps the children keep studying into the evening, or wash up and prepare for bedtime.

The outreach effort is led by the collaborative team of ECE Professor **Paul Berger**, Fisher College of Business Professor of Marketing, **Greg Allenby,** and Ohio State ECE alumnus **Turner Adornetto.** ■

Full story and video:
https://go.osu.edu/solartanzania

CubeRRT: The little satellite that could

The debut data from The Ohio State University's first satellite transmitted back from orbit, and the results look promising for future Earth scientists worldwide.

Joel Johnson, an electrical and computer engineering professor at Ohio State, said the CubeSat Radiometer Radio Frequency Interference Technology Validation satellite, or CubeRRT, contains advanced sensors for observing Earth's environment from space.

While the team demonstrated the concept in pre-launch lab tests, would it prove successful in orbit?

"The data we received on Sept. 5 confirmed successful real-time, on-board removal of RFI from CubeRRT's measurements," Johnson said. "This was the primary goal of the mission, so it was a great feeling to know we had reached this important milestone and that our little satellite was making big accomplishments up in space." ■

Read more about the results:
https://go.osu.edu/qbertdata

ALUMNI & INNOVATION

ALUMNUS NAMED DEAN AT WRIGHT STATE

Brian Rigling, an alumnus of The Ohio State University ECE program, was named dean of Wright State University's College of Engineering and Computer Science.

Rigling is an internationally respected authority in sensor signal and image processing; specifically synthetic aperture radar and waveform optimization. In 2015, he received the IEEE Fred Nathanson Memorial Radar Award, and was named an IEEE Fellow in 2018. Rigling previously served as chair of Wright State's Department of Electrical Engineering from 2014 to 2018. Under his leadership, the department established a Bachelor of Science in Electrical and Computer Engineering Technology and a Ph.D. in Electrical Engineering.

In addition, Rigling led a 100% increase of the department's externally funded research awards to nearly $8 million in 2018.

He joined Wright State as a faculty member in the Department of Electrical Engineering in 2004. He was named Brage Golding Distinguished Professor of Research in 2016. The professor also served as director of the National Science Foundation's IUCRC Center for Surveillance Research, led by Wright State, and works annually in support of the Air Force Research Lab's Center for ATR summer program. ■

Find the full story online:
https://go.osu.edu/rigling

Subscribe to the Ohio State ECE Channel:

YouTube

https://www.youtube.com/user/ECEosu

ECE ALUMNA AMONG COLUMBUS' SMART 50 AWARD WINNERS

Lisa Huang ('98), a Ph.D. alumnus from Ohio State's ECE program, was named among the Columbus' Smart Business 50 award winners for her professional determination and integrity.

Huang's career trajectory after graduating from Ohio State led to a decade of working at large engineering firms, only to branch out and become the president of her own.

The experience solidified her belief that a more personal focus on engineering consulting was the way to go. In 1998, Huang started Advanced Engineering Consultants in the basement of her home. Today, she employs more than 50 people across three cities.

"This year's honorees have made, and I'm confident will continue to make, a noticeable impact on the communities, industries and organizations that they work and live in. Each are true leaders who are passionate about the work they do," **Chris Godley** said, president of Hylant Columbus.

Over the past 20 years, since starting her own firm, Huang expanded her services from electrical engineering to full mechanical, electrical and plumbing engineering services.

Today, AEC is a respected MEPT engineering firm with over 70 employees, a large percentage of which are registered Professional Engineers.