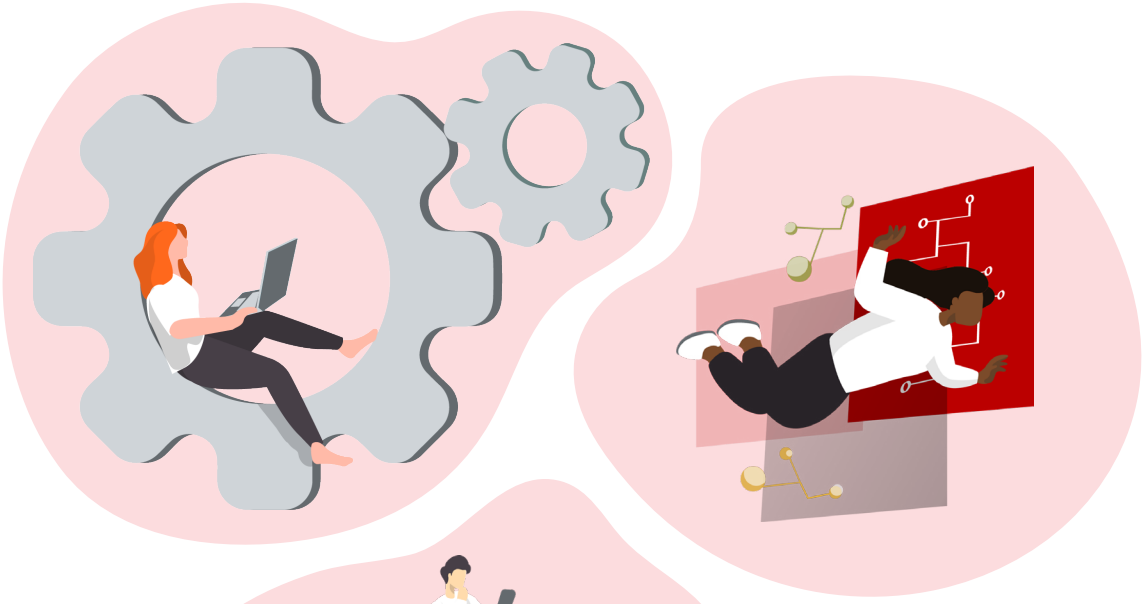
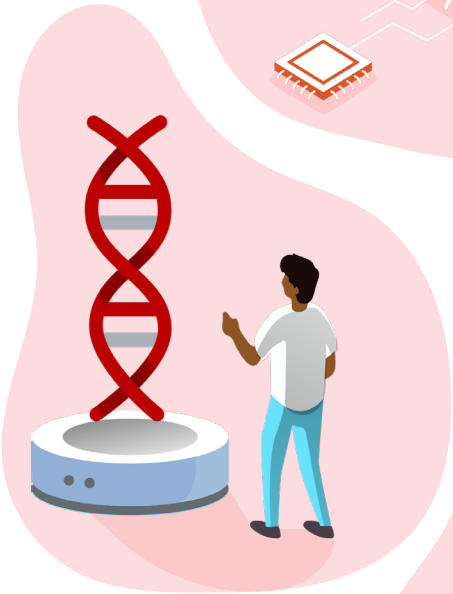
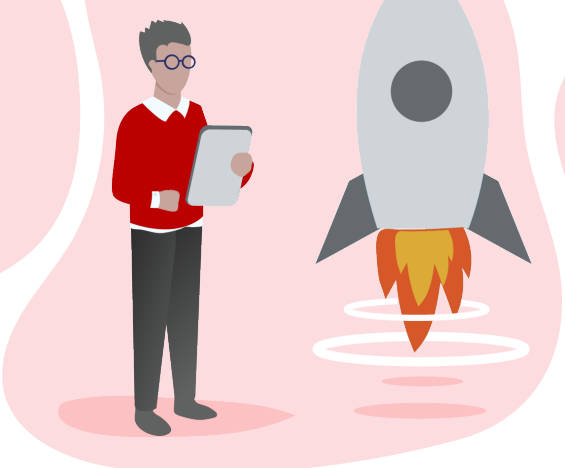
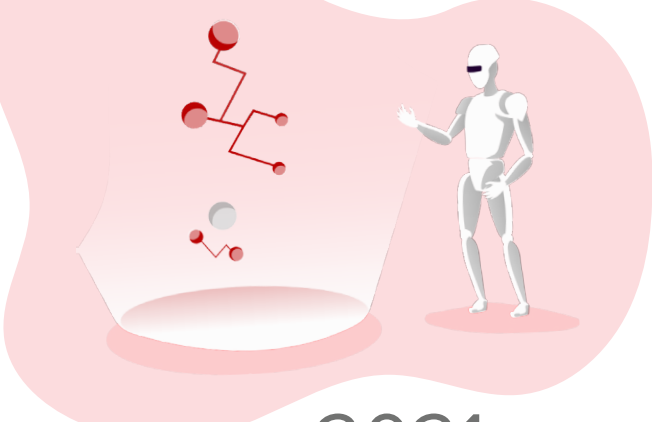
EXCHANGE

ALUMNI NEWS Department of Mechanical and Aerospace Engineering









The Ohio State University
College of Engineering

2021

Facing Changes with Innovation

Through all of the challenges faced in the past year, the Department of Mechanical and Aerospace Engineering at The Ohio State University continues its record of creating and cultivating impactful innovations and advancements in mechanical, aerospace and nuclear engineering by relying on its diversity of people and ideas.

From gears to cancer research, our **mechanical engineers** are experts in an array of specialty areas. Our strengths in both aeronautical and astronautical engineering boost the impact of our **aerospace engineers**. And, with an onsite nuclear reactor—and high-achieving graduates throughout industry and government—our **nuclear engineers** value collaboration.

Our expertise in robotics has lead to the creation of a minor program that will allow students gain experience and prepare for futures in robotic engineering (page 3). Robotics researchers have also welcomed Digit, a bipedal walking robot who can navigate many types of terrain, to the department (page 18.)

We are celebrating 60 years of research and education in nuclear engineering by way of our on-campus nuclear reactor, which is one of just 24 such reactors on a college campus in the United States (page 15).

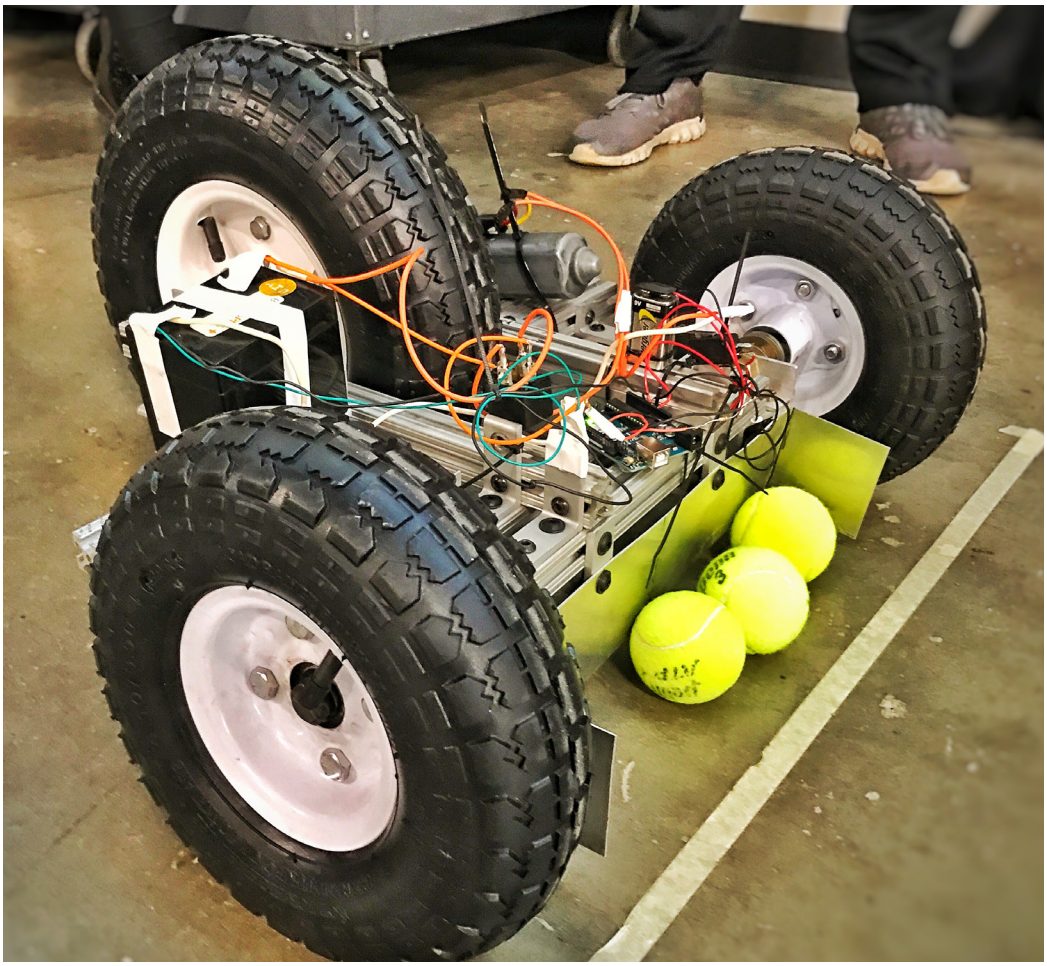
In the age of the entrepreneur we are seeing many of our young alumni making large impacts in industry. One former MAE graduate, Simon Kalouche, was recently named one of Forbe's 30 under 30. He offers insight into the intersection of engineering and business (page 22).

All of this was accomplished with our talented students, who continue to be our primary focus. They are involved in every facet of our research and we foster a spirit of collegiality among faculty, staff researchers and students.

I invite you to read on to learn about our recent cutting-edge innovations.

Rob Siston
Professor and Interim Chair
Department of Mechanical and Aerospace Engineering
The Ohio State University

MAE introduces robotics and autonomous systems minor to undergraduate program



Robotics and Autonomous Systems (RAS) encompasses transformative technologies for several key fields including healthcare, manufacturing and public safety. Recent advancements in computing, artificial intelligence and machine learning have led to an increased interest in the RAS field.

Goals of the RAS minor program include exposing students to robotics and autonomous systems engineering subjects ranging from design, analysis, control, interaction and operation. The minor will also equip students with an understanding of the robotics engineering fundamentals and basic research skills needed to succeed in R&D for the automation, healthcare and manufacturing industries.

In addition, the RAS minor aims to promote student interest in a career path in automation, manufacturing and healthcare in which robotic and autonomous technologies play a central role; and to produce a high-quality work force that is essential to revitalize manufacturing in the United States.

"While RAS programs are not new, resurgence of RAS has been fueled by recent advances in fast, mobile, computing, artificial intelligence, and machine learning," said robotics and autonomous systems program coordinator Haijun Su.

The new MAE minor program will add Ohio State to a growing list of engineering schools offering programs in the field.

"There are RAS undergraduate minor programs nationwide offered by a handful engineering schools," said Su. "These emerging RAS undergraduate minor programs directly respond to the recent call for revitalizing manufacturing sectors and regaining leadership of the U.S. in the RAS area."

The courses offered as part of the RAS minor were selected to teach students in MAE and other disciplines basic skills in the research and development of robotics and autonomous systems. The program also aims to give students an understanding of how robotics and autonomous systems can be applied to a variety of fields ranging from manufacturing, to healthcare and automation.

The courses are taught by faculty members who have experience and expertise in the RAS field. And in addition to the specialty courses offered in the minor, students have the opportunity to take research credit by working closely with faculty members on projects relevant to RAS.

To complete the minor, students take ECE/ME 5463, introduction to real time robotics systems, and at least three credit hours from the list of program approved courses. The remaining six credit hours can be fulfilled by minor approved courses or by participating in a research project relevant to the minor.

Learn more about the Robotics and Autonomous Systems minor here: go.osu.edu/RASminor

MAE athletes driven to excel in both competition and the classroom

Several demands were coming up all at once for Jake Wickert. One week last spring was a stressful time.

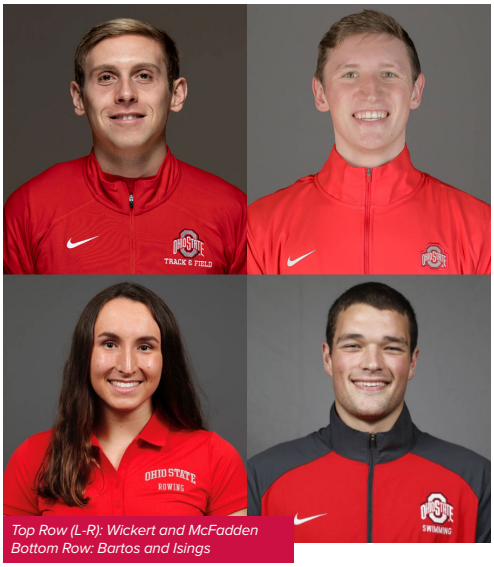
He had three exams and a lab report due that week, a stressful amount of work for any student. But for Wickert, he also needed to leave midday Thursday for a track meet in Indiana.

Wickert wanted to be his best both academically and athletically.

"It was a very challenging time," Wickert said.

He took it in stride. One step at a time, Wickert efficiently and quickly completed his academic work, making sure it was the quality he had come to expect of himself.

From there he shifted his focus to his meet, made the trip to Indiana, and ended up running his personal best in the 1500-meter race that Friday.



Top Row (L-R): Wickert and McFadden
Bottom Row: Bartos and Isings

Succeeding academically in Ohio State's mechanical and aerospace engineering (MAE) program is a difficult endeavor for any student. But for athletes in MAE, it takes an incredible amount of focus, impeccable time management and a solid work ethic to be successful both academically and athletically at the highest level.

"Juggling athletics and academics at Ohio State is the most difficult thing I have ever done, but one of the most rewarding as well," Wickert, a fourth-year in mechanical engineering and senior on the Men's Cross Country, Indoor Track, and Outdoor Track teams, said. "The lessons I have learned in time management, organization, leadership, and getting the most out of yourself and those around you are things I will use for the rest of my life, and while it is extremely challenging, I would not have it any other way. The challenges I have overcome through my time at Ohio State really makes me believe no challenge is too tall."

At the end of February each year, the Big Ten Championship swim meets are held. For swimmers, that means missing an entire week of class, a week that often falls in midterm season — where vital information is shared and crucial, grade-altering tests are given.

Evan McFadden, a first- year graduate student in aerospace engineering pursuing a PhD and former Ohio State swimmer, was all too familiar with having to play catch up while juggling competing at a championship level. By his junior and senior years, McFadden made sure to prepare ahead for events like these.

"Athletics demands plenty of time in practice and competition, but it also demands proper rest and recovery," McFadden said. "Many students find themselves up late at night studying, which is not something that athletes can do. In order to prevent late nights that would cut into rest and recovery time, athletes must have the best time management plans in place. Fortunately, Ohio State has many people on staff that are willing to help student-athletes learn these skills during their time at Ohio State."

Katelyn Bartos is a fourth-year in mechanical engineering and is on the women's rowing team at Ohio State.

Like many of her fellow athletes, not only having to adjust to a college academic schedule, but fit sports on top of that was a hard challenge to overcome as a freshman and sophomore. For Bartos, her hard lesson was learned her sophomore year.

"Fall of sophomore year was rough for me," she said. "I was still taking my prerequisite classes, which included chemistry 1250, and my class and practice schedules did not coincide well. I had 8 a.m. class on Tuesdays and Thursdays which required me to get up very early to row before, and I also had class that did not end until 5:15 which caused me to sprint across campus to make it to practice by 5:30. I was exhausted the entire semester and felt like I was constantly running between school and practice."

Another varsity swimmer, Connor Isings, was originally a math major, but is now a fifth-year in mechanical engineering. He pointed to championship season as his make-or-break time for the semester as well.

To help athletes get by, professors and lecturers in the MAE department do their best to be understanding and helpful with athletes during times like the Big Ten Swimming championships.

"I have had some extremely understanding and helpful professors during my time here and couldn't have done a lot of my schooling without them," Isings said.

Every athlete expressed how stressful and difficult juggling athletics and academics were, but Isings touched on why majoring in MAE and competing in sports at Ohio State was worth it.

"My favorite part about being an athlete in MAE is that no matter how tough the academic and athletic workload gets, I know that I am getting one of the best educations in the country while at the same time, competing at the highest level in my sport," Isings said. "I have also had the opportunity to make lifelong friends on both the team and in the classroom, creating memories that will last longer than any thoughts of difficult assignments or stressful exams."

Written by Jake Rahe

Buckeye rocketry team lands top finish at NASA student competition

Ahead of the 2021 NASA Student Launch Competition, members of the Buckeye Space Launch Initiative (BSLI) found themselves, like many other student organizations over the last year, preparing for a virtual competition.

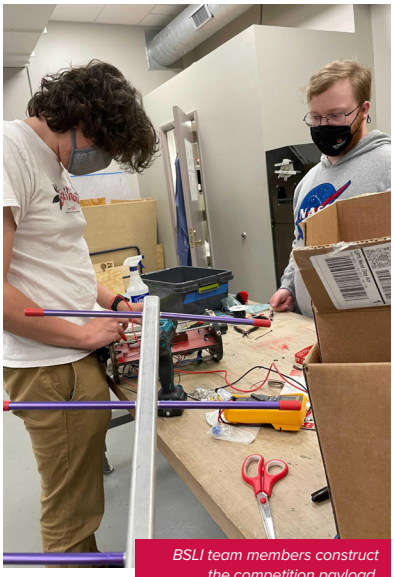
Deputy project manager Mohammed Oumer was able to attend the webinar session. When the awards were announced, Oumer was first to learn that the Ohio State team had won the Experimental Design Award for their payload design.

"I didn't think I heard it correctly," Oumer said.

Soon after, it was announced that Ohio State had also been ranked third overall in the completion's design division. Oumer texted team project manager, Ryan McElvein, to make sure he'd heard everything correctly. He had.

The Buckeye Space Launch Initiative is an interdisciplinary group of students focused on space-flight and rocketry. With a roster of nearly 70 students, BSLI divides itself between three teams.

One team focuses on the Spaceport America Cup, a competition where teams launch rockets seeking altitudes of either 10,000 or 30,000 feet. A second team, the liquids team, is aimed at the goal of designing a fully functional liquid engine, purely for BSLI's own research interest. And the third team is the NASA team, focused on the recent NASA Student Launch Competition.



BSLI team members construct the competition payload.

The goal of the NASA student launch was to send a rocket with a payload up to an altitude between 3,500 and 6,500 feet, deploying the payload upon descent.

BSLI placed third in their division, and also received the Experimental Design Award for the most creative and innovative payload design that maximized safety and scientific value.

Read the full story on the Buckeye Space Launch Initiative competition at go.osu.edu/BSLI21

Capstone Design Day

April 2022

Join us for in celebrating student research and design. Scott Laboratory hallways will be lined with displays as undergraduate mechanical and aerospace engineering students showcase projects from a variety of courses. Interactive demonstrations are a highlight of the annual event, which features collaborations with various industry and community partners.

PhD student Dung Vu selected for Ohio State Presidential Fellowship

Ohio State mechanical engineering PhD student Dung Vu was selected as one of this year's recipients of the Ohio State Presidential Fellowship.

The fellowship is given to students who "embody the highest standards of scholarship" in the graduate programs at the university going into the last stages of their dissertation research or terminal degree project. Recipients are given a monthly stipend for living expenses so they can focus solely on completing their research, as well as help with travel expenses to present at national conferences.

Vu is a fourth-year doctoral candidate who came to Ohio State from Hanoi, Vietnam.

"When I turned 18, I got a scholarship to enter KAIST, one of the best universities in South Korea and I took that chance to study abroad and travel the world," Vu said. "After graduation from KAIST, I worked as a project engineer in Korea and then Saudi Arabia for a few years before I decided to apply to graduate school."

Vu's research explores new mechanisms of energy transport by electrons based on topological properties of their equations of motion. This work not only advances fundamental understandings of electrons in solid, but also provides blueprints for future devices such as dissipation-less electronics and solid-state thermal transistors.

He is advised by Professor Joseph Heremans, and works in Heremans' Thermal Materials Lab in Scott Lab.

Vu is deeply honored to receive the award.

Dung Vu

"Clearly, I did not achieve this award on my own," Vu said. "I'd like to give thanks to my advisor, collaborators and friends who helped me to reach this achievement. This award will enable me to focus my effort in finishing my dissertation in the coming year. PhD is a long journey it can be hard and treacherous sometimes, but it has been a rewarding experience."

DUNG VU
Mechanical Engineering

MAE's new club Buckeye Vertical begins to explore Advanced Air Mobility and Urban Air Mobility

At the Ohio Air Mobility Symposium hosted by The Ohio State University in Feb. 2020, Adithya Ramaswami and Michael Valcarcel were introduced to the complexities and challenges within Advanced Air Mobility (AAM) and Urban Air Mobility (UAM).

AAM is the innovation of new airborne technology supporting an ecosystem designed to transport people and items to locations not traditionally served by current modes of air transportation, including both rural and the more challenging and complex urban environments.

Adithya and Michael knew that AAM was to be the future of air travel and had the ability to connect our world in a revolutionary way.

After assembling the team, Adithya felt that taking one step further and creating a student organization that had the potential to introduce AAM and UAM to more students at Ohio State.

That next step led to the creation of Buckeye Vertical, a new club in the Mechanical and Aerospace Engineering department at Ohio State that aims to help students explore the new world of AAM and UAM.

The goal of Buckeye Vertical is to provide students the opportunity to explore and understand AAM and UAM through professional development opportunities and project-based competitions that will support and create a platform of academic enrichment and excellence, according to Valcarcel, vice president and co-founder of Buckeye Vertical.

Lipinski receives IAEA Marie Sklodowska-Curie Fellowship

Pearle Lipinski

Nuclear engineering student Pearle Lipinski received a Marie Skłodowska-Curie Fellowship from the International Atomic Energy Agency (IAEA). According to the IAEA, more that 550 candidates from over 90 countries were submitted to the fellowship program for consideration. The fellowship is geared towards increasing female participation in nuclear science, and provides scholarships to 100 graduate students studying nuclear-related subjects.

Lipinski is advised by Dr. Carol Smidts. As a dual nuclear engineering and law student, Lipinski hopes to combine her interests in regulatory law with the field of nuclear engineering.

"Pearle is our first dual degree nuclear/law student and I am both intrigued and excited to see where this will take us," said Smidts.

"I plan on exploring how probabilistic risk assessment—which estimates risk by evaluating the consequences and likelihood of something going wrong—might need to be adapted as advanced nuclear reactors mature and are integrated into the US energy infrastructure," said Lipinski.

For Lipinski, receiving a fellowship in Marie Skłodowska-Curie's name held special significance.

"I think any woman with an inkling of STEM interest has, at some point, drawn inspiration from Marie Skłodowska-Curie," said Lipinski. "I know that I definitely did when I was younger."

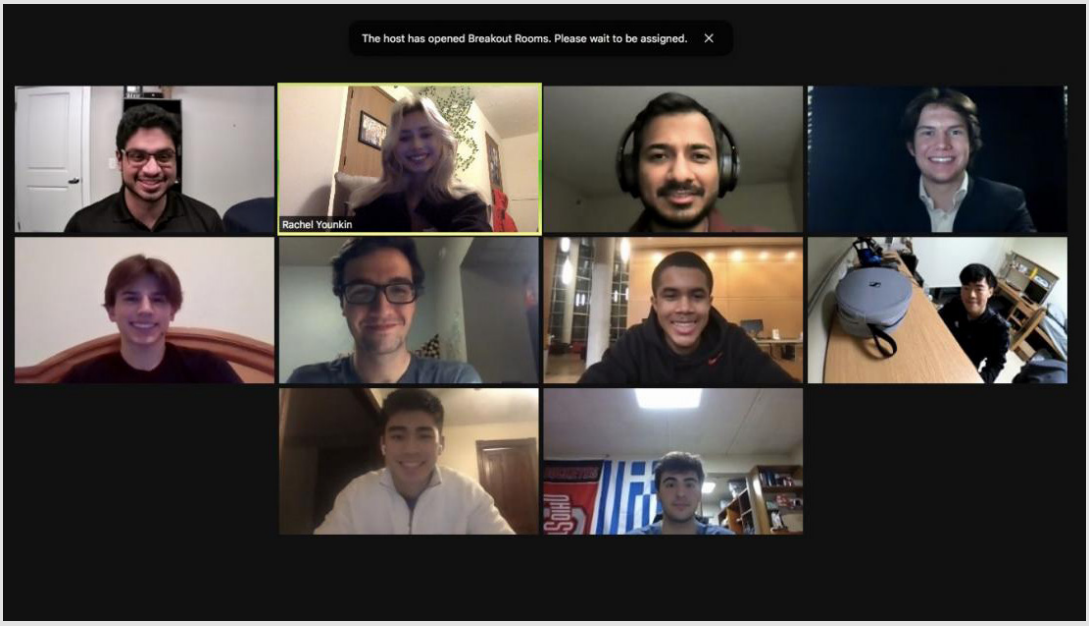
Lipinski said she is honored to be a part of the IAEA initiative to promote women in nuclear engineering.

"To be a part of the inaugural class is particularly humbling. I know that Professor Smidts' career has also been inspired by that of Skłodowska-Curie, and it is uniquely special to have this fellowship support her academic legacy as well," Lipinski said.

The Marie Skłodowska-Curie Fellowship is one of a growing number of programs taking the important step to encourage an increase in participation of women in engineering. And as for women in Ohio State's engineering programs, Lipinski had some words of encouragement.

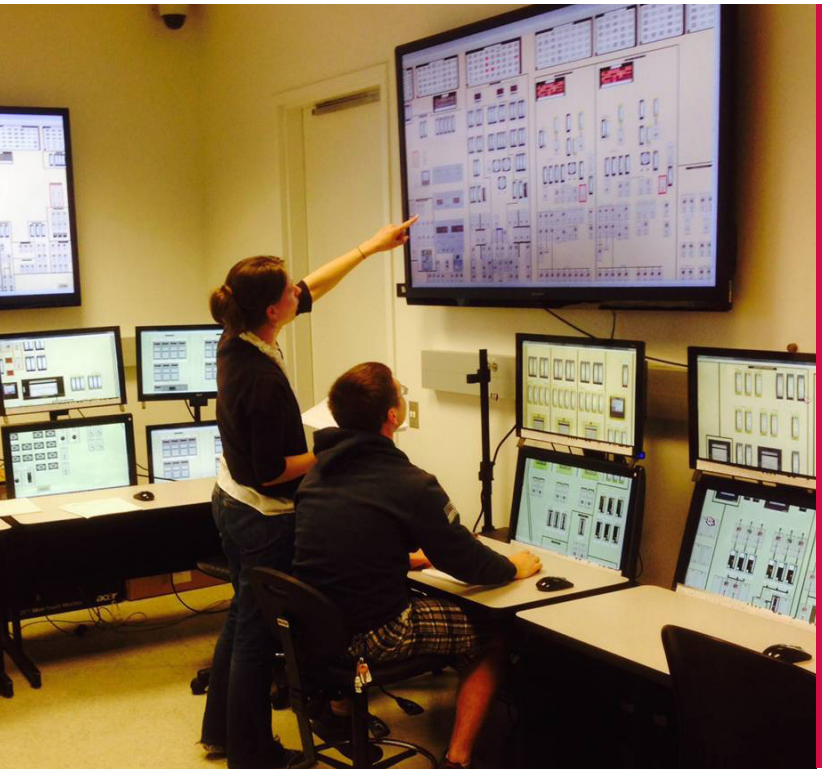
"Don't be discouraged by anyone, anytime, telling you what you can't do, and don't allow intimidation from the gender gap to erode your confidence in yourself," said Lipinski. "It is natural for these interactions to intimidate you, and they can be particularly striking after leaving school and entering the workforce for the first time. But that doesn't make you any less of an engineer—you are just as smart and capable as anyone else, and never let anyone allow you to question yourself on that."

> **"Don't be discouraged by anyone, anytime, telling you what you can't do, and don't allow intimidation from the gender gap to erode your confidence in yourself"**
>
> **PEARLE LIPINSKI**
> *Nuclear Engineering*



The Buckeye Vertical team holding one of their innaugural meetings virtually over Zoom

Learn more about Buckeye Vertical's mission, and how to support the new organization at go.osu.edu/vertical



SIMCenter awarded Honda sponsorship for simulation-based capstone course

The Ohio State University SIMCenter received an $85,000 gift from Honda to develop an undergraduate capstone program in collaboration with the Department of Mechanical and Aerospace Engineering.

With a focus on simulation-driven design, the course will teach students to use these virtual methods to inform the design process. Students will use simulation and modeling methods to explore design concepts and make engineering judgments from virtual and physical data. The design product may be a virtual model, which can be used and further developed by project stakeholders.

The course is among several programs at the SIMCenter and throughout the College of Engineering that aim to develop the digital engineering talent pipeline.

Reverse engineering an experimental drone – with a new speed record goal in sight

The Aerospace Research Center (ARC) has long been a hub of record-setting research. Among the current projects undertaken by faculty and students alike is one by graduate student Kali Boyd, involving reverse engineering a model of an aircraft to predict the flight characteristics of an unmanned aerial vehicle (UAV) that will be used as an experimental aircraft platform.

Headed by Cliff Whitfield, PhD, director of the Flight Vehicle Design and Testing Group, the project aims to push the boundaries of aircraft configuration research and development. As such, Whitfield needed a fast learner to take on the task of researching this UAV. Boyd, having graduated in 2019 with a bachelor's degree in mechanical engineering from The Ohio State University, was the perfect fit.

Boyd's project fits into a larger collaborative investigation undertaken by Whitfield and his colleague, Matt McCrink, PhD, research scientist in the Aerodynamic Flow Control and Advanced Diagnostics (AFCAD) research group at ARC. In 2017, AFCAD set a world record by flying a UAV at an average of 147 mph for 17 minutes, and this record hasn't been broken since. Whitfield and McCrink hope to create a new UAV to be used in future research, including breaking that speed record.

Much work still needs to be done before the UAV is ready to be built, but Boyd's research lays the groundwork for the rest of the stages along the road toward constructing it.

Boyd focuses her research on predicting the dimensions the UAV should have by examining a model. The model, which had already been built when Boyd took on the project, is one-fifth of the size of the proposed UAV, and it is intended primarily for testing the flight characteristics of the aircraft in the Battelle Subsonic Wind Tunnel at ARC before committing the resources to build the full-size one. Another model, a little bigger at one-third of the size, will be tested outdoors during later stages of the project.

Boyd constructing wings for the UAV wind tunnel model

Although Boyd's project isn't over yet, she's already begun writing a thesis on her findings, which she will present to her committee.

Reflecting on her time reverse engineering this model, Boyd says, "I've learned a lot from doing this project." She's confident that her experience will set her up for success in her career after graduation. "If I saw something on a different aircraft, I would be able to know why the aircraft was built that way."

Boyd already has a job lined up after graduation: she'll go on to work for the National Air and Space Intelligence Center in Fairborne, Ohio, putting her new knowledge to good use.

Written by Beck Schulz

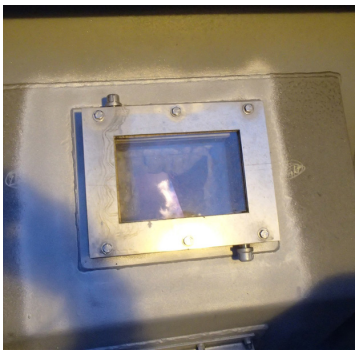
Capstone students gain experience through industry partner project

Senior mechanical and aerospace engineering undergraduate students have the chance to take part in capstone design projects that allow them to gain real-world experience in industry.

One senior capstone project is being done in collaboration with HRST Inc. HRST specializes in product design and service for heat recovery steam generators, water boilers and small gas/oil-fired power boilers.

A team of MAE students are working with HRST's products for heat recovery steam generators (HRSGs). These HRSGs take the heat from gas turbine exhaust and use it to make steam to turn a standard steam turbine for electricity generation. This process takes place in a combined cycle power plant and increases plant efficiency.

Last year, HRST came to Ohio State with the idea that students would be able to redesign and improve the viewport that is used to look inside firing ducts. The student capstone team was led by MAE professor Russell Marzette.



The Ohio State capstone student designed HRSG viewport. Photo courtesy of HRST inc.

"These view ports are, in effect, windows and are important for inspecting the inside of firing ducts which are components in Heat Recovery Steam Generators," said capstone student Daniel Prater.

The old view port had a small, four-inch by six-inch window. And these older versions of the firing duct view port are prone to deterioration.

The success of that initial project brought HRST back to Ohio State with two more capstone projects for MAE students. The first ask was a continuation of the initial project. Students were asked to do a cost-reduction study, field testing, and potentially add remote viewing for the Ohio State-designed view port. The second project is a redesign of HRST's access doors for HRSGs.

Capstone team member Thomas Troy said the potential to work on a project that could see real-world implementation is what initially attracted him to the project.

"I have enjoyed the ability to work on an industry project and to be able to communicate with current engineers in industry," said Troy.

Ohio State Design/Build/Fly team places fourth in AIAA's annual competition

The Ohio State University Design/Build/Fly team placed fourth, the best in the team's history, in the annual Design/Build/Fly competition hosted by the American Institute of Aeronautics and Astronautics (AIAA).

The team's main objectives for this year's competition were to create an electric aircraft capable of carrying a heavy payload of sensors in "shipping containers," and to deploy and retract an independently controlled sensor while in flight. The team also had to adhere to strict competition design guidelines such as a 55-pound weight limit and a five-foot maximum wingspan

The competition was scored in two parts: a 60-page design report and a video of the aircraft completing its mission, foregoing an in person demonstration due to COVID-19 restrictions. A panel of judges then reviewed the report and video, and averaged the scores together to decide the winner. More points were given for faster flight speeds, higher payload amounts and faster loading times achieved within various other constraints given by the competition rules.

"It is very gratifying to see our team's hard work payoff with the highest finish in team history at Ohio State," David Winter, leader of the Design/Build/Fly team, said. "At the beginning of last year, we set a goal to finish in the top 10. We exceeded our own goal by finishing in the top 5."

The Ohio State team placed higher than several notable schools, including the University of Michigan, Cornell, MIT, University of Pennsylvania, Purdue, Georgia Tech and the University of Southern California.

Caleb Hawley, the recruitment chair for the Design/Build/Fly team, sees an opportunity to not only pursue first place next year, but bring on a group of underclassmen that can carry the organization forward to consistent excellence and promote passion for aerospace, support careers and create a positive and inclusive community.

"The Design/Build/Fly team is one of the most fun, knowledgeable and inclusive engineering groups you will find at OSU," Hawley said. "Whether you have been around RC airplanes your whole life or you have never held a tool in your hand, you will feel welcome at any of our meetings. Design/Build/Fly is a place to learn, grow and apply your engineering coursework in a safe environment."

Honors and Awards Ceremony celebrates exceptional alumni and students

The annual Honors and Awards Ceremony in the Department of Mechanical and Aerospace Engineering took place virtually April 8, 2021. Students and alumni were honored from the nuclear, aerospace and mechanical engineering programs.

The 2021 MAE student and alumni awards banquet was held virtually over Zoom. Ceremony attendees were joined by MAE faculty, alumni and previous award winners who introduced and conferred the 2021 honorees.

Pictured top row (left to right): MAE professor Carlos Castro, MAE Associate Professor of Practice Cliff Whitfield, former MAE department chair Jim Gregory

Middle row (left to right): Samir Mittal (E.G. Bailey Entrepreneurship Awardee), Michael Bragg (Garvin L. Von Eschen Awardee), Joe Shaw (Stillman Robinson Lifetime Achievement Awardee)

Bottom Row (left to right): Brian Hajek (Marion Smith Service Awardee), Harsh Vinayak (Loofbourrow Business Achievement Awardee), S.V. Sreenivasan (Thomas French Achievement Awardee)

Stillman Robinson Lifetime Achievement Award

honoring lifetime career distinction

Robert "Joe" Shaw (BS AAE '70, MS AAE '70, PHD AAE '79) was presented with the **Stillman Robinson Lifetime Achievement Award**.

This award is presented to retired or emeritus alumni who have distinguished themselves over their lifetimes by contributing to the advancement of their chosen profession. Robinson joined Ohio State in 1878, and was the founding chairperson of the Department of Mechanical Engineering. He was also one of the founders of the American Society of Mechanical Engineers, and received an Honorary Doctorate of Science degree from Ohio State in 1896.

Joe's extensive accomplishments as a 46-year employee of NASA Glenn Research Center, make him a standout among alumni. Joe led, planned and executed all NASA Glenn strategic partnerships with other government agencies, academia and industry. He was also responsible for providing program management leadership for NASA's Ultra Efficient Engine Technology program, which developed and demonstrated critical gas turbine engine technologies. Joe's breakthrough projects enabled industry to make an informed product launch decision on a second-generation supersonic commercial transport. Additionally, he provided executive leadership for a NASA-wide initiative in regional economic development in response to a presidential directive.

The department honors the accomplishments of this aeronautical and astronautical graduate, who is a three-time graduate from MAE

Marion Smith Service Award

recognizing service to community, university and/or society

The Marion Smith Service Award is presented to alumni who have distinguished themselves by providing a level of service to the community, the university, and/or society above and beyond what is expected in their position as they made significant career contributions. Smith received his master's degree in mechanical engineering in 1947 from Ohio State. He served for more than 37 years as a faculty member and associate dean of the College of Engineering, giving generously of his time to students and alumni.

This year **Brian Hajek (MS NE '72)** was awarded the **Marion Smith Service Award**.

Doug has been a lifelong advocate for the Department of Mechanical and Aerospace Engineering. Since his time here as a student, he has shown sincere dedication to the department's success.

For more than 30 years, Brian Hajek's has taught both in the University setting at The Ohio State University and in industrial settings. In that time, he developed important new nuclear engineering courses at Ohio State that have had positive effects at OSU and beyond, leading to improvements of nuclear plant training programs, and innovated university curriculum by the introduction of operation issues into the graduate program.

His work in the area of innovative training and educational programs, like his work with graduate students on real world issues, such as reactor life extension and power uprates has significantly improved the current state-of-the-art in nuclear engineering education in the U.S.

E.G. Bailey Entrepreneurship Award

celebrating successful inventions

Samir Mittal (PHD ME '98) recieved the **E.G. Bailey Entrepreneurship Award**.

This award is presented to alumni who have demonstrated exceptional entrepreneurship as they invented new products, processes, or procedures that have been successfully manufactured, adapted, or utilized. This award honors E.G. Bailey, a 1903 graduate of Ohio State, and inventor of the Bailey meter. Bailey left an engineering job to develop and manufacture his meter which dramatically improved boiler efficiency and has been used world-wide.

Samir began his career at Seagate Technology Advanced Concepts, and eventually worked his way to the Senior Director of Enterprise Storage. In 2009, he switched career paths to develop Enterprise video software as Senior Vice President of Engineering at Qumu Corporation. In 2013 he was appointed Vice President of Enterprise Engineering at SanDisk, where he led the development of the all-flash data center. Subsequently he founded SCUTI AI, a startup focused on deep learning data center infrastructure. SCUTI AI was acquired by Micron Technology in 2017, where Samir currently works as the Corporate VP of Silicon Systems AI.

Dr. Mittal holds over 14 U.S. patents for memory and data storage related systems. Most recently, his team developed the world's fastest Solid State Drive using Micron's 3D XPoint technology, taking the product from concept to deployment in less than 2 years.

Samir has maintained a close relationship with his alma mater. He continues to stay involved as a member of the department's External Advisory Board

Rudolph Edse Award in Space Engineering

honoring excellence

Craig Streett (BS AAE '77) was presented the **Rudolph Edse Award in Space Engineering**.

Rudolph Edse moved to Ohio State in 1950, becoming the director of the Rocket Research Laboratory. His research developed several possible propellant combinations, and determined their combustion characteristics and combustion stability limits. He was also one of the first to study cryogenic rocket propellants.

The Edse Award is presented to Aerospace Engineering Program alumni who have made significant contributions to successful engineering and/or scientific advances in space related products or programs.

Craig Streett is currently a Senior Research Scientist in the Computational Aerosciences Branch at NASA Langley Research Center.

Dr. Streett's research topics have covered a wide range of topics in CFD/numerical simulation, and in the study of the physics of complex unsteady fluid-dynamic phenomena. He has lead research teams in the areas of supersonic and hypersonic transition, laminar flow control, and airframe-noise reduction. Dr. Streett was also deeply involved in the assessment, understanding, and prediction of aeroacoustic phenomena for launch vehicles under the Constellation Program.

Dr. Streett also currently serves as the Deputy Lead for the AeroSciences Technical Discipline Team of the NASA Engineering and Safety Center. He is a 1977 Alumnus of the department, earning his Bachelor's degree in Aeronautical Engineering

Alan Gregory Loofbourrow Business Achievement Award

recognizing career success

The **Alan Gregory Loofbourrow Business Achievement Award** was presented to **Harsh Vinayak (MS ME '91, PHD ME '95)**.

This award is presented to alumni who have been recognized for their significant contributions in guiding a successful product or service business, major industrial organization, or government entity.

Harsh leads NTT Data Inc.'s global operations for the outsourcing services line of business and the global shared services division, where he supervises operations with 11,000 employees over three continents.

During his time at Goodrich Aerospace, Vinayak developed a dynamic landing gear system model that is used industry-wide. At Sikorsky Helicopters, he managed R&D for the Drive Systems division and was responsible for U.S. Military and commercial R&D projects with a budget of $250 million.

Through Vinayak's hobby—radio controlled model aircraft—he developed several military-grade drones that were acquired by the Indian Armed Forces. And, as a service, Vinayak conceived and leads a multi-year, funded project to sustain the biodiversity of River Ganges.

Harsh has eleven U.S. and international patents and over 20 journal and conference articles. He graduated from MAE with a Master's and Ph.D. in Mechanical engineering in 1991 and 1995 respectively.

Thomas French Achievement Award

celebrating educators

The Thomas French Achievement Award is presented to alumni who have distinguished themselves as scholars and educators.

French, a 1895 graduate of Ohio State, served as a professor of engineering drawing at his Alma Mater, introduced new teaching methods, and authored a popular textbook. He was awarded the Lamme Medal in 1943 for his achievements.

S.V. Sreenivasan (MS ME '88, PHD ME '94) received the 2021 **Thomas French Achievement Award**

Dr. Sreenivasan received his Master's and Ph.D. in mechanical engineering from Ohio State. He currently works as a professor of mechanical engineering and the Joe C Walter Endowed Chair in Engineering at The University of Texas at Austin.

Dr. Sreenivasan has continued to stay engaged with the department through his service on the MAE External Advisory Board for several years. He also participates with the College of Engineering Campaign Committee.

S.V. is co-director of the NASCENT center, a National Science Foundation Engineering research center. He received the Technology Pioneer Award by the World Economic Forum in 2005, and the Leonardo da Vinci Award from the American Society of Mechanical Engineers in 2009. His experience has helped guide students as they move from the classroom into industry and academia.

Garvin L. Von Eschen Award

honoring leadership in aerospace engineering

The **Garvin L. Von Eschen Award** was presented to **Michael Bragg (PHD AAE '81)**. This award is presented to Aerospace Engineering Program alumni who have demonstrated technical and administrative excellence in leading successful aerospace projects and organizations.

Von Eschen joined Ohio State in 1946 as the first chairman of the newly established Department of Aeronautical Engineering. During the next three decades, he provided vision and guidance to the growing department as it established highly rated undergraduate and graduate programs, as well as laboratories for aerodynamic and rocket research.

Dr. Michael B. Bragg, Dean Emeritus of Engineering, joined the University of Washington in July 2013. He served as the chief academic officer of the college and provides leadership to over 240 faculty and more than 6,800 students.

Prior to joining UW, Dean Bragg held numerous leadership positions in the College of Engineering at the University of Illinois at Urbana-Champaign, including head of the aerospace engineering department, associate dean for research and administrative affairs, executive associate dean for academic affairs, and interim dean.

Dean Bragg earned his Ph.D. in aeronautical and astronautical engineering from The Ohio State University.

He is an international expert on the effect of ice accretion on aircraft aerodynamics and flight safety. Dean Bragg has been nationally recognized for his research and teaching. He has authored over 200 technical publications. Under his guidance more than 60 graduate students and five post-doctoral researchers received their advanced degrees.

Student Awards

Recognizing students for outstanding academic achievement, leadership and contributions to the department of mechanical and aerospace engineering

Outstanding Research Award – recognizing tudents for their research contributions within the department
Andrew Sais, George Crowley

Outstanding Research and Leadership Award – recognizing tudents for their research contributions and leadership within the department
Xianpai Zen, Jize Dai

Outstanding Academic Awards – recognizing students in each major with the highest cumulative point-hour ratio in their respective classes

Mechanical Engineering Recipients

- Sophomore: **Alex Schragal, Edward Smith, Gus Cordonnier, Matthew Kielb, Anymane Erraki, Aaron Brimmer, Rohan Deshpande, Trenton Klosz**
- Junior: **Aidan Stalker, Zhengcan Wang**
- Senior: **Megan McMahon, Andrew Grassi, Andrew Yates, Brigid Hayes, Nick Carcionne, Misha Groma**

Aerospace Engineering Recipients

- Sophomore: **Andres Lu, and Noah Hiler**
- Junior: **Patrick Brandt**
- Senior: **Thomas Bozzi**

Outstanding Senior in Aerospace Engineering Award – presented to an aerospace engineering student who has not only excelled academically, but has also demonstrated a great deal of leadership and community involvement
Jay Fields

Undergraduate Teaching Associate Awards – recognizing exceptional teaching provided by an undergraduate teaching associate in mechanical or aerospace engineering.
Joey Januszewski

Graduate Teaching Associate Awards – recognizing exceptional teaching provided by a graduate teaching associate in mechanical or aerospace engineering.
Xianpai Zeng, Alex Adrian

Rob Wolf Outstanding Senior Award Finalists – recognizing outstanding senior mechanical engineering students.

To be considered for the award, students must have a 3.0 minimum cumulative point-hour ratio and meet at least two of the following criteria: be active in a professional or honorary society; have demonstrated leadership in a campus activity or done community service; have participated in campus-wide activities; and have worked during academic year to defray costs.

Each year a committee is formed to select finalists and one awardee
Finalists: Megan Hart, Matt Bishop

Rob Wolf Outstanding Senior Award

honoring a senior mechanical engineering student in memory of Rob Wolf

The **Rob Wolf Outstanding Senior Award** is presented to a mechanical engineering student in memory of Rob Wolf, a 1997 graduate. The award recognizes students who excel academically while actively participating in department, college, university and community organizations. This year's award was presented to **Megan McMahon**.

Megan is recognized for her far-reaching campus and community involvement. Megan has worked with the Society of Women Engineers for all four years as an Ohio State student, and has attended the national Society of Women Engineers Conference. She is involved with the Texnikoi Engineering Honorary, where she has worked in various campus and community outreach programs. She also serves as Engineering Council Representative in Tau Beta Pi

Megan is also a competitive member of the Ohio State Hunt Seat Equestrian Team, and in the FEH Robot Competition. Megan was also involved with SUSTAINS, a living and learning community focused on green thinking at the local and campus levels, and went on to help design, build, and develop a hydroponics system for a sustainable garden as part of Engineers for a Sustainable World.

One of her summer work experiences led Megan to Boeing, where she designed an automated program that detected certain logic patterns within the company's Simulink flight control libraries. She interned with the Boeing 77X and 787 Autoflight Controls team in 2020 and plans to return this summer. Megan's dedication to helping others and her desire to achieve will serve her well as she embarks on her next journey after graduation in autumn 2021.

Alumni engineering healthcare solutions for space

Mechanical and aerospace engineering alumnus, Dr. George Pantalos, is involved with three NASA-sponsored, medically-related projects at the University of Louisville.

The projects include evaluating the reconstitution of preserved red blood cells, evaluating an automated surgical fluid management system with a multi-function surgical device and developing aspects of surgical capabilities for space missions.

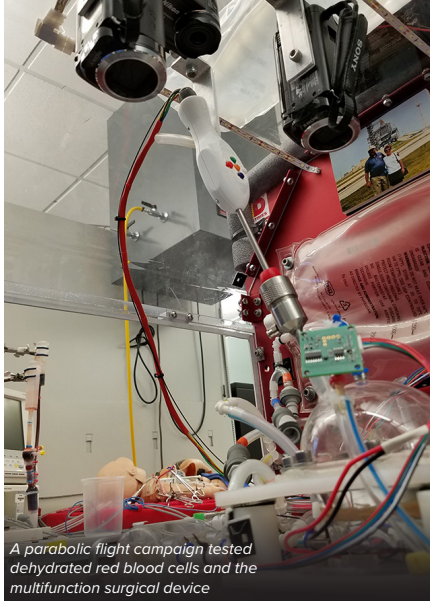
The work being done is surrounded by the context of prolonged space explorations, such as the Artemis project. Last summer, NASA announced the Artemis project that will send astronauts to the moon's surface for exploration and to observe and evaluate prolonged operation on the moon. Among many other goals, one objective is to use to project as a testing ground to eventually send exploration crews to Mars, and possibly beyond.

"When you do that," said Pantalos, "you have to have more advanced medical capabilities."

Currently astronauts on the International Space Station can resolve health issues with the supplies that are on board, and with real-time communication with a flight surgeon in mission control. In a more serious emergency, an astronaut could be back on earth and in a hospital in a matter of hours.

The research being done by Pantalos and his team focuses on providing space exploration crews with medical solutions that would keep them safe on extended journeys.

While these projects could offer life-saving medical resources on a trip to Mars, they could also revolutionize medical practice here on earth. The multi-function surgical device could be found helpful in many earth-based surgeries, because it avoids the need to exchange instruments.



A parabolic flight campaign tested dehydrated red blood cells and the multifunction surgical device

Preserving red blood cells is also a concept that could be applied to standard medical practice. The goal for preserving the red blood cells is that they will be good for five years, and be able to be stored at room temperature. The preservation method being developed for space flight could allow blood banks and hospitals to safely store, transfer, and reconstitute large supplies.

These efforts are at a crossroads between engineering and healthcare. Having worked in interdisciplinary research groups during his time at Ohio State, Dr. Pantalos said that this is an area where engineers can have a great impact.

"There are so many concepts, both scientifically and in practice that can be transferred from an engineering context to a healthcare context," said Pantalos. "It takes an interdisciplinary effort. Engineers understand problem solving, they understand design, they understand work flow and production."

Alumna is an engineer pioneer in Cameroon

Mbu Waindim has always forged her own path to success. And she wants to help others do the same.

At just 17, she moved to the U.S. to study aerospace engineering, a field that isn't widely talked about in her native Cameroon. After graduating with her bachelor's from the Florida Institute of Technology, Waindim enrolled at The Ohio State University to earn her doctorate. In 2017 she became the first Cameroonian to hold a PhD in aerospace engineering.

While at Ohio State, Waindim served as a graduate research associate in the High-Fidelity Computational Multi-Physics Laboratory under the direction of her advisor, Professor Datta Gaitonde, who was ultimately the deciding factor in her decision to become a Buckeye.

Additionally, she spent summers working at NASA Glenn Research Center in Cleveland, Ohio, and the Air Force Research Laboratory at Wright-Patterson Air Force Base. Those experiences were vital in helping to shape her future, she said.

Mbu Waindim (PHD AE '17)

After earning her PhD, she went to work for aerospace defense companies, first as a thermal engineer for Harris Corporation and later as a senior thermal analyst at Raytheon. Although she enjoyed her time working in industry, Waindim ultimately decided to explore a career in consulting.

Her current position at a global management consulting firm allows her to work on various projects for weeks at a time across a wide array of industries. It has also given her the chance to work with the public sector, which is of great interest to her. While she's no longer an engineer by trade, Waindim believes her background has proven to be essential in her new role.

Motivated by growth and the ability to see change, Waindim strives to make the world a better place for those who come after her. This passion inspired her to start a computer programming club at her alma mater in Cameroon in 2015. While she had a strong mathematics and physics background when she first went to college, she had no idea how to complete the computer programming coursework that was a requirement for her bachelor's degree. It was steep learning curve, but she persevered. The experience made her want to reduce barriers for future generations.

The Nuclear Reactor Lab celebrates 60 years of research and education at Ohio State

In 1960, The Ohio State University Research Reactor was built with the help of a $217,100 grant from the Atomic Energy Commission to establish a small-scale research reactor. On March 6, 1961 the Ohio State reactor first went critical, and began to have self-sustaining reactions. This year the Nuclear Reactor Laboratory (NRL) celebrates the 60-year anniversary of its initial criticality.

The Ohio State reactor is the only research reactor in the state of Ohio, and one of just 24 research reactors located on a college campus. In its early years the reactor's core used high-enriched uranium (HEU) fuel. In 1988, the reactor converted its fuel source, becoming only the second reactor in the United States to use proliferation-proof low-enriched uranium (LEU) fuel. In 1992 the reactor was upgraded from its original 10-kilowatt capabilities to 500-kilowatts.

Today the reactor remains a key technical and physical asset to the growing irradiation service.

> **"What started as a 10-kilowatt training reactor and is now the only operating research reactor in the State of Ohio. NRL continues to be a vital technical and physical asset providing services to allow advancement in materials, medicine, manufacturing, and nuclear technology related industries, not only in Ohio, but nationally,"**
>
> **DR. DOROTA GREJNER-BRZEZINSKA**
> **Ohio State Interim Vice President for Knowledge Enterprise**

The mission for the nuclear reactor is to produce neutrons and radiation for research support, industry service and education of reactor dynamics through experiments and demonstrations for graduate and undergraduate students gaining hands-on experience.

"Numerous Ohio State nuclear engineering graduate students have utilized the reactor for their thesis and dissertation projects over the years," said Nuclear Reactor Laboratory Director Lei Raymond Cao. "Use of the research reactor is crucial for gaining hands-on experience in nuclear engineering. This is reflected in the number of graduates who have engaged in research utilizing the reactor, and gone on to work at national laboratories where this experience is highly valued."

The NRL has been home to many sensor studies conducted by faculty members, beginning with professor Don Miller in the 1980s and 1990s, and continuing currently in the nuclear engineering program. These studies have been funded by the Department of Energy to advance state-of-the-art reactor instrumentation.

With unique capabilities like near-core large experiment irradiation, in-situ or ex-situ sensor evaluation under high temperature, high radiation dose and flexible operations, NRL has become a facility for not only university researchers, but those in industry who utilize the capabilities of the reactor lab.

A reactor operator is in the control room explaining the reactor's systems to a group of students.

In recent years, the Nuclear Reactor Lab has continued to expand its capabilities, adding the ability to conduct neutron beam experiments such as thermal neutron imaging, fast neutron tomography and high-temperature experiments. In 2017, the NRL became a partner facility of the Department of Energy's Nuclear User Facilities program, expanding access to new researchers from across the country.

"Some of the nation's most distinguished nuclear industry and government leaders have been trained on this reactor," Senior Associate Vice President for Research Randy Moses shared. "And research conducted at the NRL has had wide-ranging impact, from advancing new isotopes for radiation treatments to developing reliable satellite communication electronics that can withstand the harsh radiation in space."

Outside researchers who have worked with the Ohio State reactor include academic institutions, national laboratories, private industry and a federal agency. Recently, the NRL has received multiple Consolidated Innovative Nuclear Research awards and Small Business Innovation Research grants to support the outside research being conducted at the lab.

Since becoming a national user facility, the Nuclear Reactor Laboratory has continued to expand. While the laboratory is continuing its operation to produce neutrons and radiation to support nuclear research and education, they have added 5,000 square feet in lab space. The NRL plans to use the space to facilitate new avenues of research.

"As we expand into the new annex the additional space will allow for more student interaction at the facility as well as increased utilization," Cao added.

The 60th anniversary of the on-campus research reactor is a moment for the lab to celebrate its past. But like all researchers at Ohio State, those in the Nuclear Reactor Laboratory are focused on the future. For 60 years the Ohio State Research Reactor has maintained excellence in education, research and industrial service while meeting safety and regulatory obligations. Visioning the future, the NRL aims to not only continue to meet those needs, but exceed them.

Written by Sam Cejda

Alumni Impacts: Graduates who have made great impacts on their fields in research, industry and academia.

Sandia National Laboratories' Jacqueline Chen excels in the world of engineering

When Jacqueline Chen walked into Ohio State's placement office of the early 1980s as one of the few women in the mechanical engineering program, she had a chance encounter with a booth that resulted in an offer that would forever change her life.

She had already been in the program for a few years and completed an internship with Ohio State Professor Lit Su Han in his wind turbine lab on campus and nearing graduation needed to set herself up for success when she completed her studies.

Sandia National Laboratories gave Chen the opportunity to apply for its graduate One-Year-on-Campus Program for women and minorities, which included a summer internship prior to starting the master's program.

Chen did just that.

She completed a summer internship at Sandia's Albuquerque, New Mexico lab, working on radioisotope thermoelectric generators for power generation on spacecrafts and then went on to participate in its on-campus program to receive her master's from the University of California at Berkeley in 1982.

Nearly 40 years later, Jacqueline Chen is a Senior Scientist at Sandia National Laboratories, leading a computational combustion research group. Also, she is the PI of the DOE Exascale Computing Project on turbulent combustion, a multi-laboratory project to develop high-fidelity combustion multi-physics simulation software for exascale supercomputers on the horizon.

"The last 39 years have been great and went by quickly," Chen said. "I never intended to stay that long at Sandia but it has been such a fun, fun ride. I have mentored over two dozen postdocs in my research group who have gone on to have successful careers, and working at the Sandia's Combustion Research Facility (a DOE collaborative user facility) has enabled visitors from around the world to collaborate with us. It has been a really wonderful experience for me to perform research on turbulent combustion with computing resources on the world's largest supercomputers that the Department of Energy operates at the Leadership Computing Facility at Oak Ridge National Laboratories."

When Chen started at Sandia, she was working in its applied mechanics group at the labs' San Francisco Bay Area location in Livermore on heat transfer and numerical analysis related to national security issues.

> **"Study hard while you're at OSU. Take advantage of all the opportunities you come across there."**
>
> **JACQUELINE CHEN**
> **Sandia National Laboratories**

After a few years, Chen decided she wanted a change and also had a desire to receive her PhD. Through Sandia's Doctoral Study Program, she attended Stanford and studied fluid mechanics and turbulence research.

At Stanford, Chen worked with Professor Brian Cantwell and Dr. Naji Mansour from NASA Ames Research Center performing first-principles simulations called direct numerical simulations on some of the largest Cray supercomputers that were housed at NASA Ames back in

the mid-80s.

Returning to Sandia with more of her interests lying in combustion and computational fluid dynamics simulation, Chen decided to move to the Combustion Research Facility, where she still works today.

Her research involves peering inside of engine cylinders virtually through high-fidelity direct numerical simulations with excruciating detail, focusing on the intricate coupling between turbulence and chemistry that takes place to try and identify ways to maximize efficiency.

"It's very hard to measure the details of turbulence-chemistry interactions at the small-length scales and fast-time scales that are relevant," Chen said. "So computation is used to complement experiments and allow us to get a glimpse of these interactions that control ignition timing or combustion rates that determine an engine's performance and emissions."

Chen credits Sandia and the Department of Energy's Office of Basic Energy Sciences and the Advanced Scientific Computing Research Office with providing sustained support and a vibrant environment to work with a top notch group of peers, and allowing her to use some of the best computing technology available to perform her research.

"I had so much fun working with these people, many of whom started out as postdocs and became life-long collaborators," she said. "The work has been exceptionally interesting coupling fundamental chemical science and turbulent transport with high performance computing on computing resources at the cutting edge, because it is just like, 'why would you want to go somewhere else?'."

All of this work has not gone unnoticed. Throughout her career, she has received multiple distinctions and recognitions. In 2018 Chen was elected a member of the National Academy of Engineering. She received the 2018 Achievement Award by the Society of Women Engineers, and most recently in July, Chen was named a Department of Energy Office of Science Distinguished Scientists Fellow.

The DOE Office of Science Distinguished Scientists Fellowship comes with a three-year sponsorship for research of the fellows choosing.

For Chen, she plans to use this sponsorship to create an open-source software framework to investigate how to integrate machine learning concurrently with massively parallel simulations of turbulent reacting flows. Her goal is to extract a reduced order surrogate model representation of the high-dimensional composition space with lots of species and chemical reactions with far fewer dimensions while retaining the accuracy of the original simulation. Machine learning will also enable the detection of anomalous behavior that can be used to steer further analysis.

According to Chen, this will allow for machine learning to identify any anomalies occurring during the simulation at any given time. With the sheer volume of data generated from these simulations it cannot all be saved with sufficient frequency to capture the anomalies and analyzed at a later date.

"For example, it might be localized ignition that could lead to knock in an engine or localized extinction which could lead to misfire. You may miss those events if you save the data on storage too infrequently," she said. "It's best to perform the machine learning and analytics while the simulation is running. So we want to build the computational framework to allow other machine learning experts and computer scientists to be able to test their numerical algorithms for machine-learning and also to develop reduced order models that are predictive like the high-fidelity simulations but with a fraction of the computational cost."

> **"Don't be afraid to be opportunistic and accept a challenge in a new area."**

Chen has mentored countless post-docs and aspiring researchers during her nearly 40 years at Sandia. She has come across all types of people and has garnered some great advice for MAE undergrads at Ohio State.

"Study hard while you're at OSU. Take advantage of all the opportunities you come across there. For me, it was that internship that once you delve into the work, it opens up your eyes as to what other possible pathways exist for either further education or career development," she said. "Don't be afraid to be opportunistic and accept a challenge in a new area. Don't overplay it."

For anyone who works their way through school and has a change of heart, Chen assures that there is plenty of time and there are always opportunities to change just like she did.

Nearly 40 years ago, Jacqueline Chen walked into Ohio State's placement office in the early 80s as one of the few women in the mechanical engineering program, but today, she walks into Sandia National Laboratories working on some of the most cutting edge research in her field.

Written by Jake Rahe

SHARE YOUR STORY

You can share alumni stories to be featured in future MAE news pieces or alumni spotlights.

VISIT
go.osu.edu/AlumniSpotlight

Introducing the Buckeye biped robot

Occasionally you'll find mounds of mulch on the floor of Mechanical and Aerospace Engineering Professor Ayonga Hereid's lab. It's not a landscaping mishap. Rather, the mulch mounds are placed intentionally to pose learning opportunities for a very special resident of the lab, a bipedal robot that Hereid and his five graduate research associates call Digit.

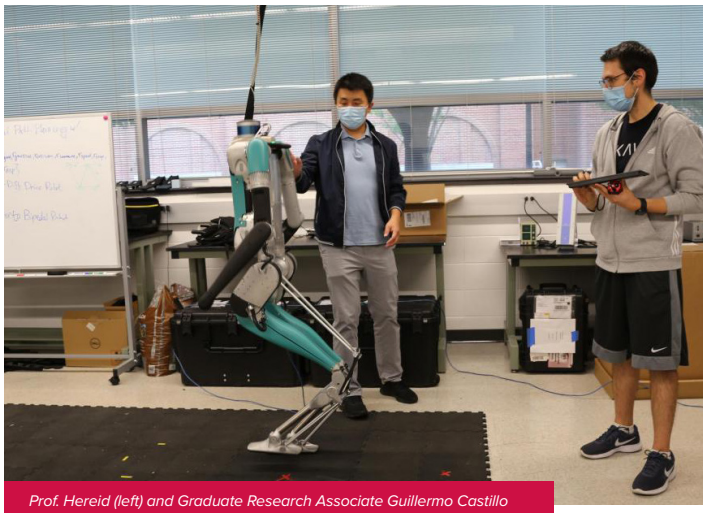
Manufactured by Agility Robotics, the robot arrived to Hereid's Cyberbotics Lab in August 2020. Despite pandemic restrictions, he and his team have spent nearly a year programming its on-board locomotion controller. This controller learns in simulation how to move the robot's many joints in a synchronized way to achieve stable walking motion over difficult, uneven terrains. Thanks to the specific learning framework that Hereid and his team developed, the simulation lessons can be seamlessly transferred to the actual robot.

"With the learned controller, Digit can respond to different locomotion commands, such as walking, climbing stairs and turning, without falling," Hereid said.

The Cyberbotics Lab team has posted several videos of their programming progress, showing Digit walking in all directions, using reinforcement learning, and reacting to small disturbances, like a push. Digit and the team also have taken a couple strolls on campus to experiment with inclines, like the sidewalk at the Garden of Constants.

This is the only bipedal robotics lab at The Ohio State University, but Hereid brings a wealth of experience in the field. He received his doctorate from the Georgia Institute of Technology in 2016 under the supervision of Professor Aaron Ames, now the Bren Professor of Mechanical and Civil Engineering and Control and Dynamical Systems at the California Institute of Technology. From 2017 to 2019, he was a postdoctoral research fellow at the University of Michigan in Ann Arbor, working with Professor Jessy Grizzle. Ames and Grizzle are widely recognized leaders in the field of bipedal robotics, particularly renowned for developing advanced control theories for walking robots and medical assistive devices.

(Left to Right): Hereid, Digit, Castillo



Prof. Hereid (left) and Graduate Research Associate Guillermo Castillo Martinez demonstrate Digit's locomotion controller

> **"With the learned controller, Digit can respond to different locomotion commands, such as walking, climbing stairs and turning, without falling."**

Over the next year, Hereid's goal is to program Digit to begin operating autonomously in a real-world environment to perform tasks amidst humans, not unlike the Yandex wheeled robots delivering carryout on campus. In fact, he said that his team is working on several proposals for funding to prepare Digit for logistics work environment tasks, like a warehouse for instance. The team is also interested in helping industry partners learn how bipedal robots could be integrated into their operations.

Article originally published on engineering.osu.edu

Design. Build. Fly: The Ohio State University Design/Build/Fly team placed fourth, the best in the team's history, in the annual Design/Build/Fly competition hosted by the American Institute of Aeronautics and Astronautics (AIAA). *(page 9)*

Faculty recognized for outstanding teaching, graduate student support and service

Four exemplary faculty and staff recently received recognition from the Department of Mechanical and Aerospace Engineering's External Advisory Board. This year **Annie Abell, Datta Gaitonde,** and **Joseph Heremans** were honored for their teaching and support of graduate students.

Abell recieved the Michael J. Moran Excellence in Teaching Mechanical Engineering Award. This award honors the exceptional dedication to teaching exhibited by Michael J. Moran throughout his career. It recognizes faculty who have exhibited similar dedication and excellence in undergraduate teaching of mechanical engineering.

Gaitonde was awarded the Gerald M. Gregorek Excellence in Teaching Aerospace Engineering Award. This award honors the exceptional dedication to teaching exhibited by Professor Emeritus Gerald M. Gregorek, and is awarded faculty who have exhibited similar dedication and excellence in undergraduate teaching of aerospace engineering.

Heremans recieved the Distinguished Graduate Faculty Award recognizing exceptional support and guidance to Mechanical Engineering graduate students in classroom teaching, graduate curriculum development, thesis advising, and professional development and mentoring.

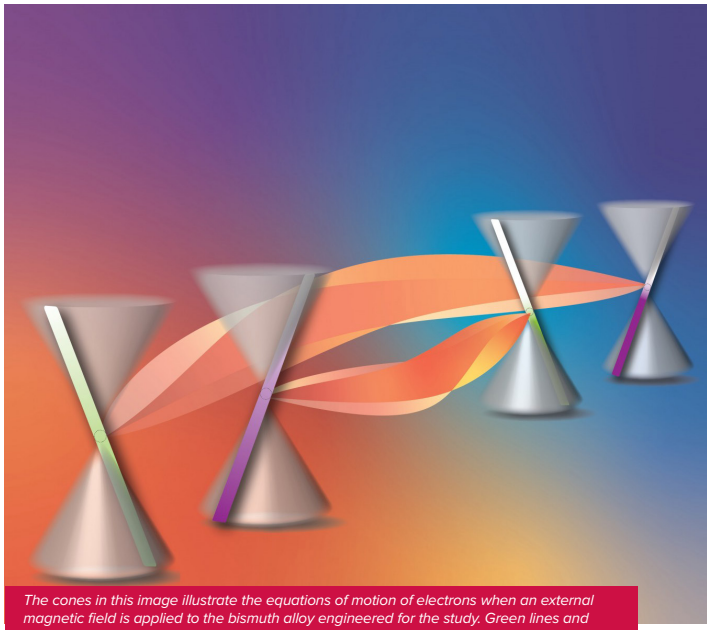
All of the awardee were selected and conferred by the MAE External Advisory Board during their spring meeting.

Top (Left to Right): Abell, Gaitonde
Bottom: Heremans

A quantum step to a heat switch with no moving parts

Researchers have discovered a new electronic property at the frontier between the thermal and quantum sciences in a specially engineered metal alloy – and in the process identified a promising material for future devices that could turn heat on and off with the application of a magnetic "switch."

In this material, electrons, which have a mass in vacuum and in most other materials, move like massless photons or light – an unexpected behavior, but a phenomenon theoretically predicted to exist here. The alloy was engineered with the elements bismuth and antimony at precise ranges based on foundational theory.



The cones in this image illustrate the equations of motion of electrons when an external magnetic field is applied to the bismuth alloy engineered for the study. Green lines and purple lines represent electrons that generate and absorb energy, respectively. Illustration by Renee Ripley

Under the influence of an external magnetic field, the researchers found, these oddly behaving electrons manipulate heat in ways not seen under normal conditions. On both the hot and cold sides of the material, some of the electrons generate heat, or energy, while others absorb energy, effectively turning the material into an energy pump. The result: a 300% increase in its thermal conductivity.

Take the magnet away, and the mechanism is turned off.

"The generation and absorption form the anomaly," said study senior author Joseph Heremans, professor of mechanical and aerospace engineering and Ohio Eminent Scholar in Nanotechnology at The Ohio State University. "The heat disappears and reappears elsewhere – it is like teleportation. It only happens under very specific circumstances predicted by quantum theory."

This property, and the simplicity of controlling it with a magnet, makes the material a desirable candidate as a heat switch with no moving parts, similar to a transistor that switches electrical currents or a faucet that switches water, that could cool computers or increase the efficiency of solar-thermal power plants.

"Solid-state heat switches without moving parts are extremely desirable, but they don't exist," Heremans said. "This is one of the possible mechanisms that would lead to one."

The bismuth-antimony alloy is among a class of quantum materials called Weyl semimetals – whose electrons don't behave as expected. They are characterized by properties that include negatively and positively charged particles, electrons and holes, respectively, that behave as "massless" particles. Also part of a group called topological materials, their electrons react as if the material contains internal magnetic fields that enable the establishment of new pathways along which those particles move.

In physics, an anomaly – the electrons' generation and absorption of heat discovered in this study – refers to certain symmetries that are present in the classical world but are broken in the quantum world, said study co-author Nandini Trivedi, professor of physics at Ohio State.

Bismuth alloys and other similar materials also feature classical conduction like most metals, by which vibrating atoms in a crystal lattice and the movement of electrons carry heat. Trivedi described the new pathway along which light-like electrons manipulate heat among themselves as a highway that seems to appear out of nowhere.

"Imagine if you were living in a small town that had tiny roads, and suddenly there's a highway that opens up," she said. "This particular pathway only opens up if you apply a thermal gradient in one direction and a magnetic field in the same direction. So you can easily close the highway by putting the magnetic field in a perpendicular direction.

"No such highways exist in ordinary metals."

Like everything quantum, Heremans said, "what we observed looks a little like magic, but that is what our equations say it should do and that is what we proved experimentally that it does."

One catch: The mechanism in this material works only at a low temperature, below minus 100 degrees Fahrenheit. With the fundamentals now understood, the researchers have lots of options as they work toward potential applications.

"Now we know what materials to look for and what purity we need," Heremans said. "That is how we get from discovery of a physical phenomenon to an engineering material."

Written by Emily Caldwell, Ohio State News
Article originally published on news.osu.edu

TEACHING EXCELLENCE

College of Engineering Faculty Awards Ceremony

Each year, The College of Engineering honors excellence in teaching, innovation and service. Faculty, researchers and partners are recognized for distinguished contributions in several areas. Four faculty from the Department of Mechanical and Aerospace Engineering were recognized.

Harrison Faculty Award for Excellence in Engineering Education

Carlos Castro was recognized for establishing an entirely new and transformative field within structural DNA nanotechnology that is focused on nanoscale mechanisms and machines implemented using DNA self-assembly.

Established in 1983 with a gift from Doris and Stanley Harrison ('58, electrical engineering), this award honors an early to mid-career faculty member's excellence in teaching and qualitative aspects of teaching, exceptional research, or contributions to engineering or architecture concepts.

Faculty Mentoring Award

Giorgio Rizzoni was recognized for his impact on helping faculty advance their careers, creating better educators, scholars, researchers and members of the academic community at Ohio State.

This award recognizes an individual faculty member in the college for demonstrated excellence in the mentoring of one or more early-career faculty members within the college.

Lumley Research Awards

Named for John H. Lumley ('27, ceramic engineering), this team award recognizes interdisciplinary research accomplishments of the college's faculty and research staff.

The Lumley Engineering Research Awards are presented to a select group of outstanding researchers in the College of Engineering who have shown exceptional activity and success in pursuing new knowledge of a fundamental or applied nature.

Lumley Research Award - *Marat Khafizov*

Professor Khafizov is an Associate Professor in the Nuclear Engineering program. He is the director of the Thermal Propoerties of Materials for Extreme Environments research group. Read about some of his recent work at **go.osu.edu/MakingWaves**

Lumley Research Award - *Jung-Hyun Kim*

Jung-Hyun Kim is an Assistant Professor in the Department of Mechanical and Aerospace Engineering and an Associate Fellow at the Center for Automotive Research. He is the director of the Energy Innovation Laboratory. His research interests encompass a wide range of energy-storage materials and devices.

Sparking interest: An early-career alumnus shares insights on professional success

Q&A with Nimble Robotics founder and CEO, Simon Kalouche

Nimble Robotics founder and CEO Simon Kalouche earned his bachelor's with honors in mechanical engineering from The Ohio State University in 2014. As an undergraduate, Kalouche was the recipient of Ohio State's Outstanding Undergraduate Research Award and the first place winner of the Denman Undergraduate Research Forum. He also minored in entrepreneurship and innovation.

Nimble is reinventing fulfillment with intelligent robots that can pick and pack anything. They already have fleets of robots out in the real world, picking millions of products for some of the world's largest retailers. Kalouche was recently named one of Forbe's 30 under 30 in manufacturing and industry for 2021.

Q: For those who don't know, what does Nimble Robotics do?

Nimble is creating intelligent robots, and we're using those robots to reimagine and reinvent e-commerce fulfillment. If you look at the best Amazon warehouse in the world today, it has a lot of automation but it's still designed around people: what people can do, where people can go, what's safe, productive, ergonomic for people. What we're doing at Nimble is teaching robots how to handle all of these objects. Once you have robots that can intelligently pick, pack, and handle any object you no longer have to design warehouses around people. In a one sentence summary, we're building autonomous fulfillment of the future.

Did you always know you wanted to be a robotics engineer?

No, the FEH [Fundamentals of Engineering Honors Sequence] program is really what got me into robotics. That was my first exposure to robotics. When I was in high school I was really into architecture, designing buildings and houses and stuff like that. So I always knew I wanted to be technical, and an engineer of some sort, but the FEH program my freshman year, where you had to design a robot to navigate a course, that's what really sparked my interest in robots.

Have you found engineering and business good crossroads for building a start-up?

Absolutely. Problem solving and being relentless, relentlessly resourceful, you need that. You need that to start a company. There's going to be a million challenges, and you don't have experience with any of them, so you just have to tackle it, break it down, understand what it is and not accept status quo. That's the other thing. The world works in a certain way, and if you want to disrupt it you can't take it as it is. You can't just assume this is how it works, this is how it has to be and this is what I'm going to do. You have to understand why it works that way, break it all down and many times there's a better way to do things.

What is the ideal future of Nimble?

We want to build the future of fulfillment. We want to reimagine everything from the inside of the warehouse to your front door, to get you what you want, when you want it, in a faster, cheaper, more environmentally friendly way. There's still tons of opportunity to do that, and we're onto something. Stay tuned for the next couple years.

When did you make the decision to switch from PhD work to founding your own business?

It was when I started working on imitation learning. Imitation learning is kind of a deep learning algorithm that allows you to train a robot from human demonstrations. This framework of imitation learning is what got me really excited about starting a company.

What advice would you give to students who want to work in robotics?

I would say do hackathons, have side projects, tinker and build stuff. That's honestly the best way. Find something that's super interesting or that you're passionate about and just build it, because that's the way you learn. You're not going to learn robotics by reading a textbook. The equations are great, but really to build something you have to tinker with it, you have to wire up the Arduino, you have to create a motor controller, hook up a camera, do some computer vision. And open source has made it so easy to just dive into. I would just encourage people to build stuff. That's the best way to learn in my opinion, by doing.

Learn more about Nimble Robotics and read the full Q&A with Simon Kalouche at go.osu.edu/Nimble

Placing students first

Putting scholars on a clear (and affordable) path to success

Each year, the best and brightest students from across the nation come to The Ohio State University to study with our faculty experts in the Department of Mechanical and Aerospace Engineering. Those students, in turn, conduct groundbreaking research, lead prominent student organizations and develop creative solutions to better our society.

It is our aim to provide MAE students with a clear and affordable path to a top-tier education. We invite you to join us in placing students first by investing in one of the department's priority funds listed below. **You can make a gift to the department by visiting go.osu.edu/MAEgiving and finding your preffered fund using the listed fund numbers.**

- **MAE Scholarship** supports scholarships within the department (**310208**)
- **MAE Priority** provides funding for emerging key areas within the department (**302655**)
- **MAE Curriculum** supports the department chair's curriculum reform project (**313090**)
- **Aerospace Priority** provides funding for Aerospace areas within the department (**302849**)
- **Nuclear Priority** provides funding for Nuclear areas within the department (**306406**)

Celebrating 75 Years of Aerospace Engineering

In 1946 the Department of Aerospace Engineering was established. This year we celebrate 75 years of aerospace engineering at The Ohio State University.

Join us in celebrate the history of aerospace engineering at Ohio State at **mae.osu.edu/aerospace75.** Find current news, history, and share you alumni stories. And consider a donation to the **Aerospace Priority** fund to help sustain the excellence in the program for the next 75 years and beyond.

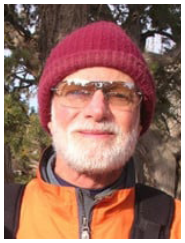
In Memoriam

Fred Dodge received his BS in mechanical engineering from Ohio State in 1948. He was a Distinguished Alumnus awardee of the College of Engineering in 2008, and had a long and distinguished career at Honeywell Corporation from 1949 until his retirement from Honeywell in 1987 as Vice President of Technology and Production for Honeywell Europe.

Dodge volunteered with many civic organizations including the Mayo Clinic and Mayo Hospital, and his church. He is survived by his wife, Jean, his children and their families.

The Department of Mechanical and Aerospace Engineering celebrates the life and contributions of **Professor Emeritus, Jack A. Collins**.

Professor Collins was a Columbus native, and three-time graduate of The Ohio State University. Dr. Collins earned his baccalaureat, master's and Ph.D. degrees in mechanical engineering, and would go on to teach at Ohio State between 1972 and 1992. His backround was in the research of materials in mechanical design. Collins would author two textbooks on mechanical engineering and machine design that are still being used in university instruction today



Professor Vernal Kenner was a California native who joined the Department of Mechanical and Aerospace Engineering at Ohio State in the early 1980s. His background was in theoretical and experimental mechanics.

Professor Kenner was an involved member of the Ohio State community. He was always willing to help organize and participate in departmental activities such as picnics and intramural softball. Professor Kenner cared greatly for the students he taught and for the colleagues he worked alongside of. He was known by many for his sense of humor, quick wit and easy-going nature. He is remembered as a dedicated and passionate educator and engineer.

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