Spring 2023

MESSENGER

MECHANICAL ENGINEERING | UNIVERSITY *of* WASHINGTON

Robotics for manufacturing,
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A growing community

As the ME department continues its extraordinary trajectory of growth, both in numbers and in the quality of our students and research, it's very exciting to be part of this community of learners, researchers and inventors. I'm happy to announce that this spring, we admitted a junior class of more than 200 students, a more than 50% growth compared to 10 years ago. Continuing a decades-long tradition, about two-thirds of our department's undergraduate students are Washington state residents.

Of this incoming class of 2024 graduates, about 20% are transfer students, most of whom come from in-state two-year colleges. Our transfer students are an important part of our community, bringing experiences and perspectives that enrich the department.

In this issue you'll meet one Ph.D. student, Malia Steward, who started her journey studying engineering at Bellevue College and is now researching solar energy in ME. We also highlight Elijah Kuska, a Ph.D. student in biomechanics of movement and a recipient of multiple teaching awards. He was honored at this year's graduation ceremony as a graduate speaker.

Our students are advancing discoveries and inventions that impact Washington state and the world. Those graduating this spring will go out into the world equipped with skills to solve challenges in fields like advanced manufacturing, renewable energy and health and medicine. These students will change the world with the education we have nurtured. Congratulations to our graduates and to everyone who has contributed to supporting them in their journey!

Alberto Aliseda

Mechanical Engineering Chair
PACCAR Endowed Professor

DEPARTMENT HIGHLIGHTS

Steve Chisholm (B.S. 1986) received the UW College of Engineering 2023 Diamond Award for his work in mentoring and advocacy for diversity in engineering. Chisholm is VP of Mechanical & Structural Functional Chief Engineer at The Boeing Company.

Assistant Professor **Michelle DiBenedetto** received the National Science Foundation Faculty Early Career Development Program (CAREER) award to support her research on the transport of microplastics and other buoyant particles in the ocean.

Dayong Gao, the ORIGINCELL Endowed Professor of Mechanical Engineering, was elected president of the International Society for Biological and Environmental Repositories.

Assistant Professor **Mehmet Kurt** received a UW Alzheimer's Disease Research Center grant and a UW Center for Human Neuroscience seed grant to study brain mechanical properties as Alzheimer's disease biomarkers. Kurt will serve as the 2024-25 ASME Bioengineering Division Diversity Chair.

Funded by the state Department of Agriculture, Assistant Professor **Aniruddh Vashisth** will lead research investigating using electromagnetic fields to eliminate burrowing shrimp from Puget Sound waters. He also received a Department of Energy Pacific Northwest National Laboratory grant to study the synthesis of transition metal oxides using radio frequency fields. ■

Entrepreneurial competitions

At the 2023 Hollomon Health Innovation Challenge, ME team **AMOR (Advanced Multi-Organ Regeneration)** won the $10,000 second-place prize. The team, co-led by Professor Dayong Gao, is developing a liver-support system to sustain patients' lives for organ recovery or transplantation. Another ME team, **SmarTrach**, won a $2,500 Best Idea Prize for developing a device that wirelessly monitors a tracheostomy tube and provides alerts when airflow is obstructed. **LegUp Prosthetics** — a team that includes ME students — won another Best Idea Prize for creating a modular, adjustable, below-knee prosthetic for children in low-resource communities.

PurePlast won the $10,000 second-place prize at the 2023 Alaska Airlines Environmental Innovation Challenge. The team of ME, dentistry and business students created affordable, renewable alternatives to single-use plastic professional dental products.

Welcome new faculty

Feini (Sylvia) Qu

Later this year, Feini (Sylvia) Qu will join us as an assistant professor in ME and Orthopaedics & Sports Medicine in UW Medicine. Her research explores cellular and molecular pathways of composite musculoskeletal tissue regeneration. Currently, Qu is a research instructor in the Department of Orthopaedic Surgery at Washington University in St. Louis. Qu holds a doctor of veterinary medicine and a Ph.D. in bioengineering from the University of Pennsylvania. She has also been an NIH postdoctoral fellow at Washington University in St. Louis.

Joe Powers

As an assistant professor in ME and in the Department of Laboratory Medicine & Pathology in UW Medicine, Joe Powers is developing a lab that seeks to understand how heart muscle cells contract, grow and remodel in healthy and diseased hearts. Powers earned his Ph.D. in bioengineering from the UW in 2017, where he investigated molecular mechanisms that regulate skeletal and cardiac muscle function. He completed postdoctoral studies at the University of California San Diego.

Jenny Robinson

Jenny Robinson is an assistant professor in ME and in Orthopaedics & Sports Medicine in UW Medicine. She is also the endowed chair in Women's Sports Medicine & Lifetime Fitness and core faculty in the Institute for Stem Cell and Regenerative Medicine. Robinson creates biomaterials and tests them with human cells to see how they interact. Previously, she was an assistant professor in chemical engineering at the University of Kansas, a postdoctoral fellow at Columbia University, a graduate researcher at Texas A&M University and a Whitaker Fellow at the National University of Singapore. She holds a Ph.D. in biomedical engineering from Texas A&M and a B.S. in bioengineering from Rice University.

Shijing Sun

Shijing Sun, who will join ME as an assistant professor, researches autonomous materials design for clean energy technologies. Currently, she is a senior research scientist at the Toyota Research Institute. Previously, Sun was a research scientist at the Massachusetts Institute of Technology. She earned her bachelor's, master's and Ph.D. degrees in materials science at Trinity College, University of Cambridge.

Engineering a better medical tape

Ph.D. student Shawn Swanson led a clinical trial for ThermoTape, a medical adhesive that becomes less sticky when time for removal.

Shawn Swanson was looking for a dissertation research project that would directly improve human health. He found that in ThermoTape, a project started by ME Research Professor Eric Seibel focused on developing a medical tape that becomes less sticky when removed from skin. Medical tape removal can lead to pain, skin tearing and the dislodgement of critical medical devices, which could result in further complications for individuals who are already injured.

"The product could pretty quickly make an impact for patients and nurses," Swanson says.

After several iterations and feedback from nurses at Seattle Children's, ThermoTape is now a strong adhesive that becomes less sticky only when ready to remove. To do this, the team created a polymeric additive that adheres the tape to skin until heat is applied.

During the first clinical trial last summer, participants reported experiencing much less pain — a 58% reduction — when ThermoTape was removed with heat.

"Our goal was for the tape to have high adhesion and then reduce the adhesion when it's time to take it off," Swanson says. "We achieved that."

For the next clinical trial, ThermoTape will be tested on individuals ages 18 to 50. The team hopes to test it eventually with kids — a higher-risk population since children have thinner skin. ■

For the clinical trial, researchers applied medical tape to participants' arms, then removed the tape the next day using a heat pack on one arm.

TO IMPROVE ROBOTS, LOOK TO BIRDS

A new model describes how birds flock together – which could be applied to build robots that move in the same way.

When the light turns green in an intersection, there's a delay between when the driver in the first car advances, and when the driver in the eighth car advances. Even self-driving vehicles don't start moving at the same time. More vehicles would be able to cross the intersection at the same light if they all "knew" the light was turning green, started together and continued moving together.

Traffic is one area studied by Professor Santosh Devasia, who recently improved a mathematical model describing how birds flock together while suppressing unwanted noise. This algorithm could be applied to build robots that work together better – such as a fleet of self-driving cars, or robots working in a large group to carry an item without damaging it.

In swarms of birds, information propagates without distortion. For example, to avoid predators, a flock of starlings can perform parallel sharp turns. Devasia's model takes into account that each bird adjusts its actions based on observations from its neighbors as well as its own previous actions, a concept he calls delayed self-reinforcement.

His improved model shows that delayed self-reinforcement can reduce distortion during information propagation, even in noisy environments. This new model could be used to improve cohesion in engineered networks, such as autonomous drone formations and in traffic.

"Our new method removes the high-frequency noise," Devasia says. "You don't want to follow the noise; you want to follow the motion." ■

QUIETING A BRIDGE

ME researchers found a solution to mitigating the noise caused by the SR 520 bridge's expansion joints.

Photo by WSDOT

Washington's Evergreen Point Floating Bridge (SR 520 bridge) has expansion joints that allow it to expand or contract to adapt to environmental changes without causing structural damage. However, expansion joints can create noise problems. When the new SR 520 bridge opened in 2016, the constant sound of vehicles driving over the bridge's expansion joints became a nuisance for area homeowners.

ME researchers found a solution to reducing the noise caused by the bridge. "We lowered the noise level about 70 percent or 10 decibels," says Professor Per Reinhall.

The project began in 2018, when the Washington State Department of Transportation contacted Reinhall. His team discovered the main sources of noise were the resonance of the air within the expansion joint gaps and the vibration of the car tires. They decided that a chevron rubber-like material would be the best option to fill in the gaps of the beams that create noise. Researchers, including Ph.D. student Sawyer Thomas, installed the materials on one lane of the bridge and tested the treatment's performance through audio recordings.

The treatment held up well for several months, then started to disintegrate. This summer, the researchers will begin exploring how to make the treatment more durable for a longer-term solution. They will then follow the treatment for a few years to determine its success. ■

A tiny break into toughness

ME researchers turn to nature to investigate how nanomaterials and nanostructure makes materials more resistant to breaking.

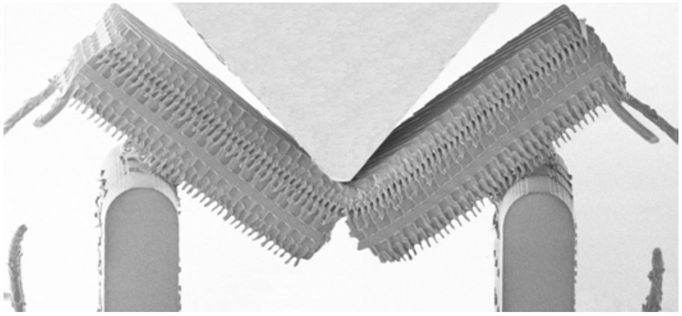
The nanofibers that comprise many natural materials from shell to skin to cartilage are surprisingly tough and can handle force without fracturing. Inspired by natural nanostructured materials, the Meza Research Group recently investigated how these tiny structures make materials resistant to breaking. The team's research sheds light on how methods like reducing fiber size and increasing fiber twist can improve durability.

The lab, led by Assistant Professor Lucas Meza, used additively manufactured polymer nanofibers to create twisted Bouligand structures, a common twisted-fiber motif found in arthropod shells. The final test samples they made were about 80 micrometers wide.

The researchers discovered two methods for toughening the materials: isolating the fibers and twisting the fibers. They found isolated nanofibers had greater ductility, or ability to stretch further before breaking, meaning they could absorb more energy to prevent cracks from growing. Twisting the nanofibers at different angles creates different soft and stiff regions between the layers. Because of this Bouligand-style architecture, cracks then get "stuck" between the soft and stiff layers and have more difficulty progressing, making the material tougher.

These discoveries have implications for the printing of more resilient additively manufactured materials, and for objects created using nanomaterials, such as composites and electronics.

"By understanding how fracture happens at the smallest length scales, we can develop new ways to make tougher, more resilient materials at any scale," Meza says. ■



UW researchers tested the twisted nanostructures they created by applying very small loads with nanometer precision and visualizing when cracks began to form.

ROBOTICS FOR MANUFACTURING

Researchers are exploring how robotics and AI can help improve manufacturing workers' safety, standardize processes and more.

By Lyra Fontaine

Working alongside industry partners, ME faculty and students are researching ways to improve manufacturing workers' safety, automate inspections and enhance robots' abilities to interact with objects around them.

In the UW Mechatronics, Automation and Control Systems Laboratory (MACS Lab), researchers study how machines and automation processes can positively impact people's lives. The lab is led by Xu Chen, Bryan T. McMinn Endowed Research Professor in Mechanical Engineering.

"Artificial intelligence is creating significant new opportunities," Chen says. "Enabling robots to intelligently manipulate objects could assist workers in completing manufacturing tasks."

In the Boeing Advanced Research Center, Assistant Professor Krithika Manohar develops algorithms to predict and control complex dynamical systems, which are unpredictable situations where conditions evolve over time. Her work includes optimizing sensors for decision making in aircraft manufacturing.

"AI and machine learning are very powerful in this space because engineering processes are strictly regulated," she says. "AI models, when applied to these very well-controlled processes, can learn the patterns much easier. They can find the variables that affect the defects of these parts."

Here we highlight how Chen, Manohar and other ME researchers are using robotics to improve manufacturing processes.

A robotic grasper

How do you teach robots to grip objects and detect when the objects are slipping? A new project in the MACS Lab combines visual and tactile feedback in industrial robots that perform tasks alongside human workers. Previous studies have proposed only visual or only tactile feedback algorithms to grasp objects. This project, funded by the UW + Amazon Science Hub, mimics how humans use both vision and touch to grip objects.

The researchers — including ME Ph.D. student Xiaohai (Bob) Hu and master's students Aparajit Venkatesh and Guiliang Zheng — are using a robot with a 2D stereo camera and a parallel gripper that has pressure sensors in their experiments. They developed an algorithm that detects when an object slips from the robotic grasper more than 99% of the time.

"Robotic grasping is a complex task that involves challenging perception issues, planning and executing precise interactions, and utilizing advanced reasoning," Chen says.

Detecting and preventing objects from slipping out of the robotic grasper could be useful abilities for robots that work alongside workers in warehouses, manufacturing facilities and other environments. For example, a grasper with slip-detection capabilities could hold and move heavy objects such as machinery parts or automotive components, pick up fragile items without damaging them, sort items such as packages and handle wet or slippery items like produce.

The researchers have tested their approach with 10 common objects, including a sponge, box, book, tennis ball and screwdriver. Next they plan to increase the force of the gripper and change the location of where it grasps the object to prevent the item from falling.

Researchers developed an algorithm that detects when an object slips from a robotic grasper more than 99% of the time. Photo by Dennis Wise

Student Utsav Seth wears a motion-tracking camera and pressure-sensing gloves while smoothing a layer of composite material. Ph.D. candidates Anand Krishnan and Xingjian Yang monitor the data being collected. Photo by Lyra Fontaine

Automating visual inspection

Manufacturers sand aircraft parts to smooth them and identify defects before painting. The MACS Lab is part of a team with GKN Aerospace, GrayMatter Robotics and EWI that's developing a way to robotically sand aircraft parts.

The MACS Lab is focused on one key part of the project: automating the visual inspection of sanded aircraft canopies — the transparent enclosures over cockpits — and windshields. To make this easier, the researchers created a robot that inspects the materials after the sanding process. A high-resolution camera captures detailed images of the surface and detects defects, such as scratches and chips.

This technology could support workers who inspect the entire surface of aircraft parts to identify sanding mistakes, a challenging process to standardize.

"We automated the process to improve consistency," says ME graduate student Colin Acton. ■

Improving worker safety

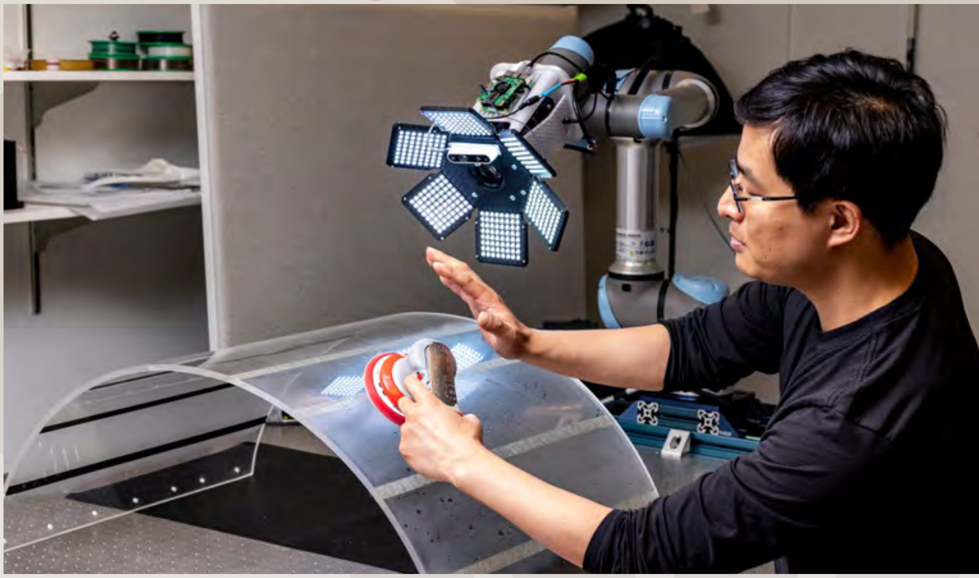
Workers can experience injuries repeatedly performing manual tasks in aerospace manufacturing. One such task is composite hand layup, a process in which layers of composite materials are applied and smoothed by hand to conform to parts, and then cured.

Manohar and Ashis Banerjee, an associate professor of ME and of industrial and systems engineering, are working on quantifying the ergonomic risk of Boeing technicians who perform hand layups of composite materials. They're doing this by collecting data from participating employees, who wear a head-mounted motion-tracking camera and pressure-sensing gloves as they work.

The researchers use the data to assess a worker's body pose and movements associated with injury. They then quantify levels of ergonomic risk based on industry-standard metrics. The project is jointly funded by The Boeing Company and the Joint Center for Aerospace Technology Innovation (JCATI).

"Currently, there is no way to quantifiably assess what is happening to the worker as they are doing these processes," Manohar says. "We're quantifying the risk to workers in a data-driven way, instead of having a subjective evaluation."

This type of assessment could also be relevant to workers doing riveting installation or other work that adds stress to the hands.



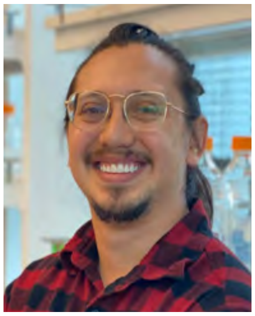
Above, Xu Chen demonstrates sanding a mockup of an aircraft canopy section. Photo by Dennis Wise

Research was sponsored by the ARM (Advanced Robotics for Manufacturing) Institute through a grant from the Office of the Secretary of Defense and was accomplished under Agreement Number W911NF-17-3-0004. The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the official policies, either expressed or implied, of the Office of the Secretary of Defense or the U.S. Government. The U.S. Government is authorized to reproduce and distribute reprints for Government purposes notwithstanding any copyright notation herein.

HELPING STUDENTS SUCCEED AS RESEARCHERS

Graduate students share their experience with a new ME course focused on research and DEI skills-building.

A new ME course, Entering Research, aims to ease the transition to graduate-level studies while helping students become more confident, independent and inclusive engineers. The course focuses on practical research competencies as well as diversity, equity and inclusion (DEI) awareness and skills-building. Here, three students share their experiences with Entering Research:



René Arvizu

René Arvizu took Entering Research to learn strategies for balancing new responsibilities. He benefited from DEI discussions in class and from assignments such as having important conversations with his mentor.

“I learned a lot about how the culture and relationship with supervisors and peers should be in a research lab. My biggest takeaway is that the relationship and the environment is as important as the actual research itself,” he says. “I also learned that diverse labs provide various points of view that can more effectively innovate in research procedure.”

Arvizu is excited to continue his research on microfluidics in Assistant Professor Ayọ̀kúnlé Ọlánrewájú’s lab.

“Being part of the Ọlánrewájú Lab has been everything I was looking for in graduate school, with great mentorship, innovative research and strong community building,” Arvizu says.

Seohyun Park

“I’m interested in researching flexible and wearable electronics not only because of their robust functionality but also because they can contribute to prolonging the well-being of humans and the environment,” says Seohyun Park.

As Park began her research in the iMatter Lab, she decided to take Entering Research. She identified essential topics to discuss with her mentor, such as roles, expectations and research procedures.

“Coming from a non-engineering background, I wanted to learn the general process of engineering research — from finding a lab and communicating with a principal investigator (PI) to developing my own research ideas,” she says. “In addition, I was interested in incorporating social justice into engineering research and wanted to learn more about it.”

Ehsan Aalaei

Ehsan Aalaei, a Ph.D. student from Iran, took the course to become familiar with academic and research procedures at the UW, improve his English and communicate with other students in a safe space.

Aalaei says he learned how to support historically underrepresented groups to ensure a healthy workplace for all. In addition, the class helped him communicate with his PI and research group members. Aalaei is studying cancer under the supervision of Ọlánrewájú.

“As a researcher and a cancer survivor who knows the sufferings of this disease very well, it’s important to me to do research in this field,” he says. “I hope to be effective in finding ways to prevent and treat cancer in the years ahead.” ■

Making an impact through research and teaching

Ph.D. candidate and instructor Elijah Kuska is advancing biomechanics research while meeting students where they are.

Elijah Kuska is passionate about improving treatment for individuals with neuromuscular disorders. He's also an instructor who helps students learn about mechanical engineering principles and discover what excites them about engineering.

In the Steele Lab, Kuska focuses on modeling and simulation of gait in individuals with neuromuscular disorders, specifically cerebral palsy. Cerebral palsy is a disorder caused by an injury to the developing brain primarily affecting one's coordination and ability to control their muscles. Kuska simulates changes in neuromuscular control and investigates how those changes affect an individual's walking pattern, function and fatigue.

"Modeling and simulation allows us to ask fundamental questions that we're unable to investigate experimentally," he says. "We hope this research can help inform clinicians so that interventions and treatments are more effective."

Accessible and interactive teaching

Teaching has been an important part of Kuska's academic experience. Recently, as a lecturer for ME 230: Kinematics and Dynamics, he took an interactive approach to teaching. He created simulations to help students understand complex problems and developed "real-life assignments" to connect class concepts to students' interests. For one assignment, students found examples of systems where potential energy is converted to kinetic energy — such as a pinball machine or hydroelectric dam — and described how the energy is stored, released and conserved.

Committed to accessibility, Kuska opted to continue hybrid teaching and office hours throughout the past school year. Students could access lectures in-person or remotely, both live and asynchronously. They also had an online platform to discuss topics covered in class. By providing many modes and mediums to learn, Kuska enabled more options and flexibility for students, including for those who could not attend class for medical reasons or because they work a full-time job.

"My three teaching pillars are constant feedback, building connections and accessible learning," he says. "Making courses accessible to all is a fun challenge, and one I think all teachers must do."

Kuska enjoyed using emojis to help students engage remotely and in-person. He encouraged students to provide feedback about their comfort with the subject matter via "thumbs-up" or "thumbs-down" emojis on their computers, and in the final days of class, he invited students to make memes about the class. Students created graphics with jokes about coursework and his teaching style.

At the end of the course, students gave Kuska a big "thumbs-up": His teacher evaluation scores were the highest an ME 230 teacher had ever received.

In 2024, Kuska will join the Colorado School of Mines as an assistant teaching professor. He hopes to continue to inspire students to pursue their engineering interests.

"I had a lightbulb moment while teaching," he says. "I realized that this is what I'm meant to do." ■

Read the full story:
me.uw.edu/news/biomechanics

AN EMPOWERING EDUCATION

ME Ph.D. candidate Malia Steward shares her journey to researching renewable energy and how she's working to improve solar cell efficiency.

Malia Steward's interest in renewable energy began when she was an electrical engineering undergraduate student at the UW Bothell. While completing her bachelor's and master's degrees there, she participated in solar cell research led by Seungkeun Choi, an associate professor of electrical engineering. Choi's mentorship helped Steward stay motivated, even when experiments became frustrating and repetitive.

"My mentor has had a huge impact on my academic career, for which I am incredibly grateful," Steward says.

After receiving the National Science Foundation Graduate Research Fellowship Program award, Steward decided to pursue her Ph.D. studies to gain a deeper knowledge of material properties and how to create textured surfaces. ME's program piqued her interest because of the faculty, access to the Washington Clean Energy Testbeds at the Clean Energy Institute (CEI) and the microfabrication equipment in the Institute for Nano-Engineered Systems.

Since joining the ME department in 2018, Steward has continued her solar energy research with Choi. She also works with J. Devin MacKenzie, Washington Research Foundation Professor of Clean Energy and an associate professor in ME and materials science and engineering, to build solar cells and assess their performance. For the past year, she has been a teaching assistant for the CEI multidisciplinary course Energy, Materials, Devices and Systems, which trains students across the scales of clean energy — from materials and devices to storage and power grid integration. The class has enabled her to share her research with students from engineering, chemistry, physics and even business.

"It's exciting to see how students react to their first exposure to measuring a solar cell after they fabricate them by hand," she says. "Because the students are from various disciplines, they ask questions based on their understanding and knowledge upon analyzing the data. I respond in a way to answer their questions that makes sense to them, and our collaboration also helps me to look at my own research from a different perspective."

In her research, Steward explores how different conditions of solar cells — such as changing their thickness or altering the softness of their base — can impact their light absorption and ability to generate electric power.

"A high-performing solar cell excites me because it tells me that my original hypothesis — such as changing the thickness of a specific layer or modifying the semiconducting layers — was correct," she says. "This encourages me to expand further into the work with additional experiments, possibly discovering something new along the way."

Steward is excited about the potential applications of her research.

"It's a pivotal time for students and researchers to collaborate and bring in new, innovative ideas to help make significant, positive changes to the planet, such as combating climate change," she says. ■

Steward instructs an undergraduate student on how to measure a solar cell's performance inside a controlled environment. Photo by Dennis Wise

Alumni spotlight: Meet Ben Hempstead

The ME alum reflects on his time at the UW, his career and his role on the department's Executive Advisory Board.

Ben Hempstead is part of ME's Executive Advisory Board (EAB), which is one way he gives back to the department that he graduated from in 1994.

A fourth-generation engineer, Hempstead was exposed to the field at a young age, but he credits the UW for expanding his knowledge and interest in engineering. He enjoyed classes about machine design and simulation and was on the UW Human Powered Submarine team, where he got to apply the skills he learned in the classroom to a real-life project.

"Extracurriculars and labs helped me realize that this is the right career for me," he says.

Hempstead remembers being one of the first people in ME to use digital tools to do his coursework. He helped other students use computer-aided design (CAD) and finite element analysis (FEA) software, a skill that came in handy throughout his career.

After graduating, Hempstead landed a job as a mechanical engineer at aerospace automation company ElectroImpact. Initially he designed components for riveting machines. Fascinated by the machinery he worked on, the role further piqued his interest in using 3D tools and CAD. "I became interested in using 3D assembly for my own work," he says.

Hempstead's responsibilities grew as his role in the company progressed. He led interdisciplinary composites fastening projects, designed a wing line for the Boeing Airbus A380 and became automation lead for a Boeing 777X project.

Most recently, Hempstead's role at ElectroImpact was as chief of staff. He fostered customer and business relationships, advocated for more funding for engineering education at the Washington State Legislature, transformed the company's digital systems and continued working on engineering projects.

Last year, Hempstead started a new role as the director of prototyping at the design consultancy Teague. The company designs and creates prototypes and physical and digital mockups that aim to improve the human experience for a variety of clients, including designing the architecture and passenger experience for commercial aircraft and spacecraft.

Hempstead recently became director of technical services at Teague. The role involves leading the mechanical design and automation teams plus designers working on mixed reality or extended reality (XR) technology projects and reviewing technical work.

Over the years, Hempstead had continued to stay engaged in ME. He's given several talks about his career to students and, when invited to join the EAB, he accepted.

"I was excited about the opportunity to give back and shape the curriculum," he says. "I really enjoy learning from the faculty and my fellow board members about what they're working on. I love that the department has this well-curated group of industry peers that can advise it, and I'm grateful to be a part of it." ■

MECHANICAL ENGINEERING
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2023 GRADUATION

This year ME awarded 180 bachelor's, 106 master's and 24 doctoral degrees to the class of 2023. The department appreciates the friends and family who came together to celebrate their achievement.

A special thank you to this year's graduation speaker, Mekonnen Kassa, '94 BSME, who shared his inspiring educational and career journey with ME. Originally from Ethiopia, then a refugee in Sudan, Kassa came to the U.S. 35 years ago as part of a refugee resettlement program. While working as a taxi driver, he enrolled in English as a Second Language courses and attended the UW, where he received his degree in mechanical engineering.

Today, as Senior Director in Cloud Security Product Management at Microsoft, Kassa leads a global team of customer experience engineers. His team engages with enterprises, governments and institutions to help them protect their assets by hardening their security posture, detecting and responding to attacks, and meeting compliance requirements.

Thank you, speakers

Chair's Distinguished Industry Lecture Series:
James McLurkin, Google; Melissa Orme, Boeing

Boeing Advanced Research Center Seminar:
Melissa Orme, Boeing

Leadership Seminar Series:

Greg Greeley (BSME '86), Thrasio; Krishna Nadella (MSME '02, Ph.D. '09), Vesicus; Sam Browd, Seattle Children's & UW Medicine; Dennis Heaney (BSME '85), Special Operations Command Pacific; Robyn McLaughlin, Microsoft; Heide Piper, Ret. U.S. Navy & NASA; Nyle Miyamoto (BSME '91), Boeing; Ben Hempstead (BSME '94), Teague; Bernie Qi (BSME '07, MSME '17), Fresh Consulting

Department Seminar Series:

Daoyi Dong, University of New South Wales; Nathan Wiebe, University of Toronto; Sawyer Fuller, UW Mechanical Engineering; Peter Cho, Analog Garage; Mehmet Kurt, UW Mechanical Engineering; Vinamra Agrawal, Auburn University; Laurel Kuxhaus, National Science Foundation; Bruce Gale, University of Utah; Navid Zobeiry, UW Materials Science & Engineering; Ricardo Serrano, Stanford University; Lian Shen, University of Minnesota; Juming Tang, Washington State University; Ellis Meng, University of Southern California; Sutanu Sarkar, University of California San Diego; Wei Chen, Northwestern University; Alicia Koontz, University of Pittsburgh