The Trend in ENGINEERING

UNIVERSITY OF WASHINGTON COLLEGE OF ENGINEERING NEWSLETTER / **AUTUMN 2020**

A college transformed looks to the future

PAGES 18-19

FROM THE **DEAN**

In this issue of *Trend* we reflect on the past 10 years of the UW's "Be Boundless — For Washington, for the World" campaign and what it has meant for the College. In one word, it's been transformational. Your generosity, partnership and support has transformed students' lives, our research enterprise and our community. On behalf of the College, I am humbled and honored to thank you.

In the past decade, nearly 16,000 individuals and organizations have invested in the College. At the same time, the Legislature funded enrollment expansion in engineering and computer science which allowed us to nearly double in size. Critical capital projects that supported our student growth were completed thanks to private and public investment.

There is a direct link between investment in engineering — degrees and research — and overall economic health. Below we share news of a recent economic impact report that revealed that the College generates $594 million in economic impact.

As we look to the next 10 years, I am committed to building a great educational experience while expanding opportunity and access for all students. And, to advancing research and innovation for the public good. We're heading into a school year like no other. While the challenges that lay ahead are indeed great, the ingenuity, perseverance and resilience that our engineering community has shown this year inspires me. The best things we do as engineers, we do as a team and as a community. I look forward to continuing to transform UW Engineering — and the world — with all of you.

Nancy Allbritton, Ph.D., M.D.
Frank & Julie Jungers Dean of Engineering

Washington impact

Each year, the College of Engineering turns out engineers, research and innovations that contribute to Washington's economic strength and vitality. There is a direct link between investing in engineering — degrees and research — and overall economic health as detailed through a recently published economic impact report.

DID YOU KNOW:

- The College generates $594.3 million in annual economic impact for Washington*
- College alumni in Washington have generated $14.3 billion over their careers
- The College supports and sustains 3,252 Washington jobs
- The College is the #1 source of UW startups
- The College generates $32.4 million in state and local tax revenues per year
- The economic impact of College research totals $254.4 million, supports 2,342 jobs, and generates $12.3 million in state and local taxes

For every dollar of state appropriation invested in the College of Engineering, an additional six dollars is generated in the economy.

The UW engaged Parker Philips, Inc., to measure the economic contribution of the University's operations across the state of Washington. This is a snapshot of the College's contribution.

**This contribution to the local and statewide economies is a point-in-time snapshot from audited FY18 numbers*

Jihui Yang appointed Vice Dean

Jihui Yang, Kyocera Professor of Materials Science & Engineering and department chair since 2017, was named vice dean in August. In this role, Yang serves as the principal research administrator for the College. He ensures that the College's research is conducted in a creative, efficient and ethical manner and fosters best practices for integrating research with the College's educational goals. He also provides leadership for strategic initiatives, and represents the College in activities related to major gifts fundraising, as well as federal and state relations.

In his research, Yang designs, synthesizes and tests advanced thermoelectric materials and lithium-ion battery materials for energy conversion and storage. He has authored 130 papers, holds 20 U.S. patents and has established strong research funding, including a partnership on battery research with Pacific Northwest National Laboratory (PNNL). He is a fellow of the American Physical Society and has received the Campbell award from GM Research & Development and the U.S. Department of Energy's INCITE award.

Dan Ratner named Associate Dean of Academic Affairs

A Bioengineering faculty member since 2007, Dan Ratner began leading the College's academic programs and initiatives to support student success as Associate Dean of Academic Affairs in June. In this role, he manages student-focused educational processes, implementation of ABET processes and educational innovation. Ratner has served as the UW's Interim Associate Vice Provost for Enrollment Management, on several campus-wide academic standards and admissions committees, and has been instrumental in the College's path to Direct-to-College admission.

Ratner has a record of excellence in teaching and has been recognized with awards, including the College of Engineering Dean's Award and selection to the National Academy of Engineering Frontiers in Engineering Education. He has mentored over 125 postdocs and students. His research focuses on leveraging molecular engineering and chemical synthesis to design materials for diagnostics and pulmonary drug delivery. He has patented inventions and launched a medical device company that has licensed UW technology to address critical needs in transfusion medicine.

UW launches CREATE

The new UW Center for Research and Education on Accessible Technology and Experiences (CREATE) is led by an interdisciplinary team whose mission is to make the world accessible through technology.

Launched in May thanks to a $2.5 million investment from Microsoft, the center will position the UW as a leader in accessible technology research and design.

CREATE's leadership team hails from six academic units: the Paul G. Allen School of Computer Science & Engineering, The Information School, Rehabilitation Medicine in the UW School of Medicine, Mechanical Engineering, Human Centered Design & Engineering, and the Disability Studies Program. Researchers will build upon projects in prioritizing and automating personalization; transportation accessibility; augmenting abilities through wearable technologies; developing inclusive, intelligent systems and data sets; and "do-it-yourself" accessible technology production.

Learn more at create.uw.edu

A decade ago, the UW launched the "Be Boundless — For Washington, For the World" campaign with the idea that what you care about can change the world. During this time, 15,878 individuals and organizations gave $496,458,333 in support of the College of Engineering, helping to propel us to the top tier of engineering schools. And the Washington State Legislature invested in enrollment expansion in engineering and computer science, plus capital projects to support the student growth.

Last June, the UW closed the books on the campaign — the most ambitious in the UW's history. Here we highlight some of the transformational investments made in the College.

A college tr

MAY 2012:
The Legislature appropriates $3.8M for 2013 to expand engineering and computer science enrollments.

JUNE 2012:
A $2M gift from Amazon to establish two Amazon Professorships in Machine Learning enables a cluster hire of high-profile faculty.

DECEMBER 2012:
Geda and Phil Condit endow a fellowship in the William E. Boeing Department of Aeronautics & Astronautics.

JUNE 2013:
The Legislature provides $4.4M annually to expand computer science and engineering enrollment in fiscal years 2014 and 2015. It allocates $3M a year for the Clean Energy Institute and $3M for the Joint Center for Aerospace Technology Innovation.

DECEMBER 2013:
Jeet and Jan Bindra, UW Engineering's campaign co-chairs, fund the renovation of a Chemical Engineering lab, the first of several significant campaign gifts.

JULY 2014:
Washington Research Foundation makes significant investments to advance innovation in clean energy, protein design, data science and neuroengineering.

JANUARY 2015:
An agreement with Boeing launches the Boeing Advanced Research Center (BARC) in the Department of Mechanical Engineering, bringing Boeing engineers to campus.

JUNE 2015:
The Legislature provides $32.5M for the Gates Center building in the biennial capital budget. Also directs $2M of the Education Legacy Trust Account for 2015-16 and $4M per year thereafter to expand enrollments in computer science and engineering.

NOVEMBER 2015:
Cherng Jia (C.J.) and Elizabeth Hwang establish a professorship in Electrical & Computer Engineering to support research to treat spinal cord injuries.

IMPACT BY THE NUMBERS

JUNE 2010	JUNE 2019
778 bachelor's degrees and **390** master's degrees awarded	**1,352** bachelor's degrees and **724** master's degrees awarded
College research expenditures total **$113M**	College research expenditures total **$173M**
226 faculty members	**275** faculty members
5.9% of undergraduates are underrepresented minority students	**8.4%** of undergraduates are underrepresented minority students
20.8% of undergraduates are women	**30%** of undergraduates are women

MARCH 2016:

Scott and Catherine Roberts make a gift to fund a distinguished endowed fellowship in the Department of Chemical Engineering.

JUNE 2016:

The Hopper-Dean Foundation supports a diversity partnership between the Paul G. Allen School of Computer Science & Engineering and STARS, a program supporting engineering students from underserved Washington state high schools.

AUGUST 2016:

STARS receives a three-year, $2.2M grant for growth from the state's Opportunity Expansion Fund, supported by funding from Microsoft.

NOVEMBER 2016:

Milton and Delia Zeutschel establish a professorship and student capstone program to support entrepreneurship and industry partnerships in Electrical & Computer Engineering.

MARCH 2017:

A $50M endowment from Paul Allen and Microsoft establishes the Paul G. Allen School of Computer Science & Engineering.

JUNE 2017:

The Legislature provides $1M annually for fiscal years 2018 and 2019 to expand undergraduate enrollments in science, technology, engineering and math.

SEPTEMBER 2017:

A surprise $5.2M bequest from the estate of Olga McEwing represents the lead gift for the College's Campaign for Students scholarship drive.

DECEMBER 2017:

Rao and Usha Varanasi make a significant planned gift to enhance their existing endowed fellowships in Aeronautics & Astronautics and other areas.

MARCH 2018:

The Legislature provides an additional $3M per year to expand enrollments in computer science and also funds pre-design of the Interdisciplinary Engineering Building.

JUNE 2018:

Tom and Marilyn Draeger and the Beavers Charitable Trust establish a term faculty fellowship in Civil & Environmental Engineering, complementing an existing professorship and scholarship.

FEBRUARY 2019:

The Bill & Melinda Gates Center for Computer Science & Engineering is dedicated.

APRIL 2019:

Backed by industry support, the Legislature funds an increase for undergraduate engineering degree production, the STARS program, and design of the new Interdisciplinary Engineering Building.

MAY 2019:

Fundraising for the Interdisciplinary Engineering Building begins.

AUGUST 2019:

A pledge by Steven and Connie Rogel establishes an endowed professorship for cardiovascular innovation in the Department of Bioengineering.

MAY 2020:

Microsoft's $2.5M investment launches UW's Center for Research and Education on Accessible Technology and Experiences (CREATE) to improve accessibility for people with disabilities.

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THE UW/WRF PARTNERSHIP

How do brilliant research ideas become innovations that change lives? Washington Research Foundation (WRF) answers this question by facilitating technology transfer from academia to industry.

A long-term UW partner, WRF (and its venture fund, WRF Capital) played a transformational role throughout the "Be Boundless" campaign via commercialization gap funding and support programs, research grants, professorships and gifts of critical instrumentation. Over the past decade, the College has benefitted from WRF investments totaling more than $20M.

A key way WRF advances innovation at the UW is creating endowed professorships and chairs, enabling faculty to pursue research that may not be eligible for federal funding. Instrumental in launching many UW spin-offs, WRF also guides faculty through the commercialization process. Recognizing that start-ups need access to equipment to bridge the commercialization gap, WRF supported the purchase of equipment and facility updates needed to launch the Washington Nanofabrication Facility in Fluke Hall in 2014.

Investing IN THE FUTURE

ALLEN SCHOOL DIRECTOR MAGDA BALAZINSKA DISCUSSES HOW MAJOR "BE BOUNDLESS" CAMPAIGN GIFTS WILL SHAPE THE UW'S COMPUTER SCIENCE AND ENGINEERING PROGRAM FOR YEARS TO COME.

Photos by Mark Stone / University of Washington

In March 2017, a $50 million endowment from Paul Allen and Microsoft established the Paul G. Allen School of Computer Science & Engineering, elevating the UW's computer science and engineering program from a department to a school. Two years later, the Bill & Melinda Gates Center for Computer Science & Engineering opened. The building doubled the space for the program and expanded opportunities for new and diverse research, collaboration, innovation and education.

The College of Engineering's Chelsea Yates spoke to Allen School Director Magda Balazinska about the impact of these major investments and how they will shape innovation for years to come. A recognized leader in data management systems, Balazinska has been a UW faculty member since 2006. Prior to her current role — which she assumed in January 2020 — she directed the eScience Institute and served as Associate Vice Provost for Data Science at the UW.

The Allen School naming was a tribute to Paul Allen's vision of the role that science and engineering should play in society, particularly how technology can help solve humankind's greatest challenges. We have certainly experienced great challenges this year. How is the Allen School living up to its name?

Bearing Paul Allen's name inspires and challenges us every day.

We have faculty working to democratize medicine and increase access to technology in underrepresented and rural communities. Our researchers are designing robots to assist individuals with disabilities. COVID-19 created new challenges, and many of our faculty immediately pivoted their research to respond. Our Center for Digital Fabrication, with UW Medicine and campus partners, produced medical supplies for health care workers. In another lab, researchers worked with health care professionals to create a contact tracing app that preserves people's privacy. Other researchers focused on the spread of misinformation, and others began developing machine learning models to assist with patient triage.

Computer science and engineering should be done for the greater good; the Allen School is full of individuals who are guided by this idea.

How does private support transform research and teaching?

As technology evolves and the need for computer scientists and engineers continues to grow, our program needs to grow, too. It's our responsibility to prepare the next generation of innovators who will produce ideas and technology that benefit society. We now have wet labs for our computer architects, labs for research in fabrication and accessibility and for hands-on student learning, and spaces for molecular programming, robotics and neural engineering. None of this is possible without partnerships and private support.

Scholarships and fellowships help make education affordable and accessible to students and help us recruit students who are hungry to learn, excel and change the world. Endowed professorships provide recognition and funding that give faculty room to take greater risks.

Because of private support, the Gates Center enabled the Allen School to double the number of students admitted to the program. This helps the community by turning out more highly capable graduates. Our state has a huge workforce gap in computing, which we are addressing: In 2010 we granted 277 degrees and last spring there were 600, which is very exciting.

What are the Allen School's top priorities moving forward?

Number one is computer science and engineering for the greater good. That's what focuses our innovation. And we must continue to maintain a strong foundation in fundamental technology. We also need to continue to educate as many students as possible while keeping the quality of that education high. We must ensure computer science is accessible to all; while we've made strides in diversifying our community, we need to do more. I'm fortunate for the groundwork laid by my predecessors Ed Lazowska and Hank Levy. Their vision transformed our teaching and research directions and has set us on a solid path. We have a great community, excellent partners, a terrific dean and president. It's exciting to be innovating and carry this work forward.

Thanks to major gifts during the Be Boundless campaign, the Allen School is a research and innovation leader. What impact does this have on the regional economy?

The Allen School produces amazing graduates, and most stay and work in the Seattle area. The need for computer scientists extends across many industries; thanks to campaign contributions we are producing even more talent to broadly fuel local industry. Campaign investments have allowed us to deepen the school's industry research partnerships. Industry has more access to cutting-edge academic research, while faculty and students draw from their industry experience to inform their work. Through our speaker series and conferences, we host events that bring the top minds in academia together with industry leaders in ways that companies can't. And entrepreneurship is thriving; Madrona Venture Group alone has funded 15 Allen School startups.

You're still settling into your first year as Allen School director. What have you learned so far?

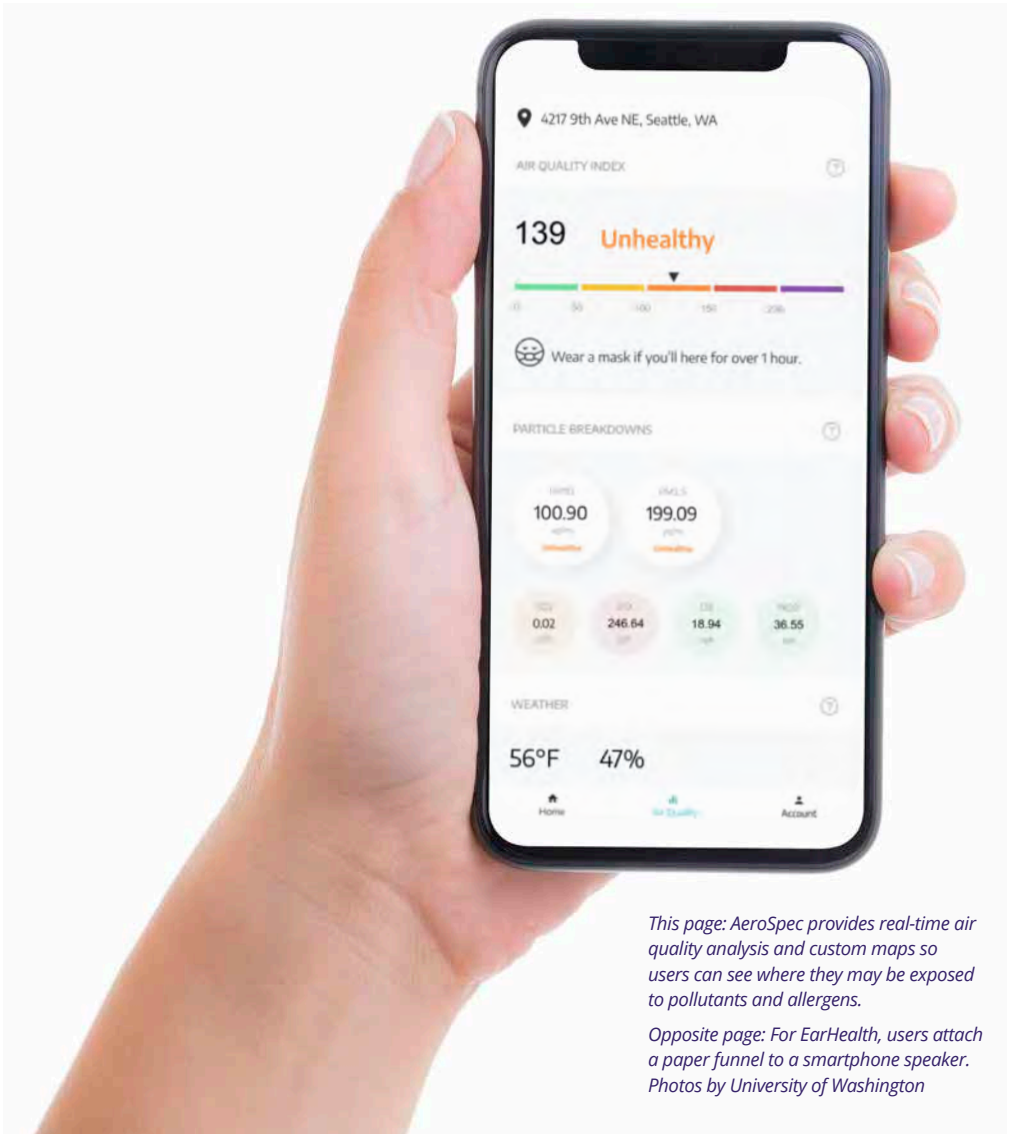
Since January we've all been operating against a backdrop of continuous change and challenges. Every day I'm inspired by our community's resilience, flexibility, kindness and dedication. For example, when our faculty learned they would need to shift to online teaching, and had only two weeks to adjust, their concern wasn't simply how to do it — they set out to do it in the best way possible for the students and the course content. That meant creative solutions: revising teaching strategies, redesigning classes and implementing new tools. I've always been proud to be a part of the Allen School, but never more than now. We will get through these challenging times, and we will do so together.

Photos opposite page, top: The Bill & Melinda Gates Center for Computer Science & Engineering (CSE) opened on campus in 2019. Bottom left: Allen School Director Magda Balazinska. Bottom right: Paul G. Allen, center, with Wissner-Slivka Chair in CSE Hank Levy, left, and Bill & Melinda Gates Chair in CSE Ed Lazowska, right, in 2017.

Health care in your hands

By Malavika Jagannathan

We highlight four smartphone apps being developed by College of Engineering researchers and partners to save lives and keep people healthy. These apps are a snapshot of the lifesaving innovations made possible with the support of private philanthropy and public funding.



This page: AeroSpec provides real-time air quality analysis and custom maps so users can see where they may be exposed to pollutants and allergens.

Opposite page: For EarHealth, users attach a paper funnel to a smartphone speaker. Photos by University of Washington

AeroSpec:
Real-time air quality analysis

A healthy high school athlete falls ill, but doctors struggle to find the cause. Eventually, they nail an unlikely culprit: a fungus along her regular running route.

Real-time information about air pollutants and allergens could have replaced months of isolation and testing. That's why Jiayang (Joe) He and Sep Makhsous, as UW engineering doctoral students, developed AeroSpec. By combining government air quality data with personalized readings from a small portable monitor, their app creates a custom map to show where the user is exposed to pollutants and allergens.

"The three things people are concerned with are mold, dust and pollution," Makhsous says. "We want to give them a location where it's happening, so they can take the appropriate action to stay healthy."

With a $50,000 grant from CoMotion, the team is turning a UW research project into a viable commercial product. To understand needs, they've conducted interviews with pulmonologists, pediatricians and people with airborne sensitivities — and they're ready to test the app widely in preparation for its release.

Funded by: UW Buerk Center for Entrepreneurship, UW CoMotion, UW Jones + Foster Accelerator Program, Boeing, Joint Center for Aerospace Technology Innovation, National Institutes of Health

AVAILABLE: JANUARY 2021

PupilScreen:
Rapid diagnosis for traumatic brain injuries

From Little League practice fields to the battlefield, traumatic brain injuries (TBIs) are commonplace — but there's no foolproof test to diagnose them when and where they occur. Many of the immediate diagnostic tools in use are subjective — even the penlight test typically used in emergency rooms — while pupilometers and CT scans are reserved for only the most serious injuries.

PupilScreen aims to fill that gap. Developed by a team of UW doctors, computer scientists and engineers, the app converts any smartphone into a highly accurate pupilometer, detecting changes in the eye's response to light, to assess the severity of an injury.

With PupilScreen, first responders, athletic trainers and even parents can get an objective assessment right away — helping them determine whether a trip to the hospital is necessary.

Funded by: UW CoMotion, Amazon Catalyst, National Science Foundation, Washington Research Foundation

AVAILABLE: IN 12–18 MONTHS WITH FDA APPROVAL

EarHealth:
At-home testing for ear infections

It's the middle of the night. Your toddler is fussy and keeps rubbing her ear. Half-awake, you struggle to figure out if your child needs a doctor's visit and possibly medication.

A piece of paper and a smartphone app could help you decide.

EarHealth, designed by a team of UW computer scientists and ear, nose and throat doctors, checks for fluid behind the eardrum — a common symptom of ear infections.

The user cuts and folds a piece of paper into a small funnel, then attaches one end to the phone's speaker with the other end next to the ear. The app sends a chirping sound through the ear canal and analyzes the echo to determine if fluid has built up behind the ear, taking just a few seconds.

Diagnosing ear infections can be difficult, especially in children who have trouble describing their symptoms. The EarHealth app is easy to use and accurate. In a test at Seattle Children's Hospital, the app's algorithm correctly identified the presence of fluid 85% of the time.

Funded by: National Institutes of Health, Washington Research Foundation

AVAILABLE: JANUARY 2021, PENDING FDA APPROVAL

Second Chance:
Detecting opioid overdoses to save lives

With an opioid overdose, the difference between life and death can come down to seconds.

Second Chance, a lifesaving app developed by UW anesthesiologists and computer scientists, can make the difference, by monitoring a person's breathing rate to detect an overdose.

Users activate the app before they inject drugs. The app sends inaudible sound waves from the smartphone to bounce off the user's chest, scanning for specific breathing patterns based on how the sound is reflected back. Slowed or stopped breathing often signals an impending overdose, at which point the app connects the user with a friend or emergency services.

The team designed and tested the app's algorithm with real-world data from a supervised injection facility, where overdoses frequently occur. In tests, Second Chance has been effective about 90% of the time.

Funded by: UW Alcohol and Drug Abuse Institute, National Science Foundation

AVAILABLE: PENDING FDA APPROVAL THROUGH UW SPINOUT SOUND LIFE SCIENCES

Learn more about these apps and others at uw.edu/boundless/mobile-health-apps

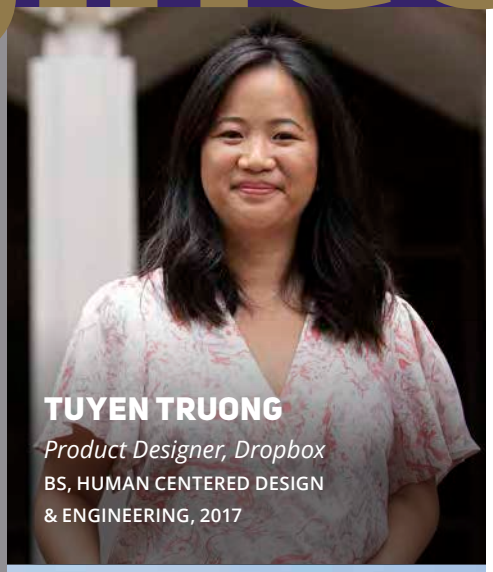
Engineering

Since 2013, STARS — the Washington STate Academic RedShirt program — has provided the extra support that underserved Washington students need to succeed in engineering. 239 students have participated in STARS at the UW; of the program's 77 graduates so far, 59 have engineering degrees.

The College of Engineering's Chelsea Yates spoke with three recent graduates about how they're using their degrees and how STARS helped them get there.

Learn more about STARS at engr.uw.edu/stars

Photos by University of Washington



TUYEN TRUONG

Product Designer, Dropbox

BS, HUMAN CENTERED DESIGN & ENGINEERING, 2017

What do you do at Dropbox?

My team creates solutions that support Dropbox employees. I'm currently improving an internal campaign tool that Dropboxers use to create, preview, launch and analyze campaigns. My job is to make the tool flexible, adaptable and scalable. I partner with many roles and, as a result, I learn all sorts of things. One day, I'm conducting user research, and on another day, I'm in a bug bash with QA engineers and software developers to identify gaps

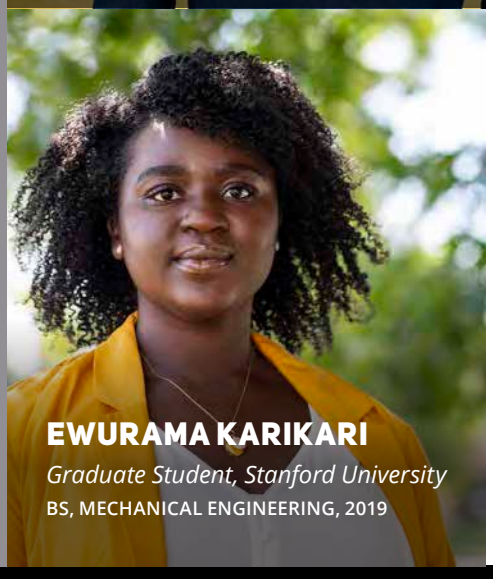
IVAN CORDERO

Structures & Payloads Design Engineer, The Boeing Company

BS, AERONAUTICS & ASTRONAUTICS, 2019

Tell us about your work at Boeing.

I review and inspect engineering designs for the Boeing 787 Dreamliner to ensure they are compliant per company, customer and regulatory requirements. I enjoy the wide range of projects our team handles. We interface with other engineering teams so there's always something new to work on. Prior to starting full-time I interned on the Boeing 767 and 777 and supported 787 production in the factory as a mechanical engineer.



EWURAMA KARIKARI

Graduate Student, Stanford University

BS, MECHANICAL ENGINEERING, 2019

What are you studying in graduate school?

I'm pursuing a master's degree in mechanical engineering with a concentration in mechatronics and robotics. I work in Stanford's Assistive Robotics and Manipulation Lab. My research involves path planning — using algorithms and neural networks to develop pathways for robotic devices. My goal is to complete my degree, then work in the research side of industry, after which I may return for a Ph.D.

STARS

between implementation and specs. There are also days where I'm meeting with product leaders about goal setting.

How did STARS set you up to do what you're doing now?

STARS gave me the platform to study a field — HCDE — that I didn't know existed. It also taught me that if you're comfortable, then you're not learning. I've held onto this idea, and it led me to my current role, which I never imagined I'd be in!

What have you learned in the transition from being a student to a professional?

It's up to me to identify my goals and steer my career path. My manager can introduce me to project opportunities and people, but I need to speak up for myself and communicate my interests. In school, exams and grades validate performance. But in the working world, it's up to me to ask for feedback.

Where do you see yourself in the next few years?

I plan to work in product design for many years as there's still so much to learn! I'd like to mentor future designers and advocate for more diversity in design. We need more people of color, first-generation graduates and talent from underserved communities.

How have you applied skills you learned from STARS to your current role?

One skill that stands out — especially due to this "new normal" of remote work — is the importance of collaboration. Being able to communicate and work together in large teams was instilled in me early on through STARS. I use these skills every day.

What have you learned pivoting from being a student to a professional engineer?

I've learned the importance of continuing to develop soft skills — maintaining a conversation, communicating with individuals outside of my field, and listening to everyone's point of view. STEM fields tend to overlook these skills, but they are necessary in the workplace.

What's next for you?

I see myself getting ready for a management role. Outside of work, I hope to travel and give back however I can.

How did STARS set you up for success in grad school?

STARS instilled in me a growth mindset that hard work is essential. My STARS math instructor Dave Prince used to say, "What works is work." He meant that you have to dive in and commit to doing the work. I apply this all the time in grad school. I served as a STARS calculus tutor at the UW, and I've drawn on that experience a lot at Stanford, where I've been a course assistant for undergraduate mechanical design and dynamics and control classes.

How is grad school different than undergrad?

Time management is critical in grad school, and so it's important to have someone to keep you accountable. STARS taught me about the value of having a community. One of the first things I did at Stanford was build a network, get involved with the Black graduate student organization and make friends. Research is important but so is having a community of people who know what you're going through and can understand your experiences.

What do you like best about being a UW Engineering alumna?

I love how excited I get when I meet another UW Engineering alum! The engineering world isn't as big as you think, and it's so fun to have a shared UW engineering experience.

A twist of fate

By Chelsea Yates

THE UW MAKING CONNECTIONS PROGRAM HELPED SHAPE THE COURSE OF UW ENGINEERING ALUMNA AYAN HASSAN'S LIFE—AND ONE OF THE PROGRAM'S FOUNDERS DID, TOO.

Ayan Hassan, '12, '16, is laughing with a group of young women eager to talk with her about science and engineering. Which classes should they take? What are the job options? When should they start thinking about internships? They have a million questions, and the room is charged with energy and the buzz of many voices.

It's a scene Hassan is used to. When she's not managing new market expansion initiatives for Amazon, the UW Engineering alumna volunteers with K–12 outreach programs, encouraging girls and all young people of color to see themselves as tomorrow's engineers, doctors, scientists and computer programmers.

"When they think of engineers, they don't think of someone like me," she says, giving the group a warm smile. "I want them to see that there are Black women engineers."

It was the UW's Making Connections program that filled that role for Hassan as a teen, showing her what was possible for her own future. But it was a future that was nearly derailed.

A meaningful connection

Born in Somalia, Hassan emigrated to the U.S. as a child with her parents and five siblings. As a student at Seattle's Garfield High School, she learned about Making Connections, a college readiness program offered through the UW Alene Moris Women's Center. It turned out to be life-changing.

"Though supportive, my parents weren't familiar with the American higher education system," she remembers. "Making Connections opened the door to college for me."

The program helps students from underrepresented communities in Seattle pursue science, tech, engineering and math (STEM) fields. It was established by a group of local STEM professionals — dynamic, dedicated "founding mothers" determined to make STEM education and careers accessible to girls from low-income families without college-graduate role models. Since it began in 2007, 100% of its students have been accepted to college.

Back then, Hassan didn't know that one of those founding mothers would be instrumental not only in getting her to college, but in saving her life.

Switching gears

Hassan came to the UW to study medicine. But after meeting students from the UW chapter of National Society of Black Engineers (NSBE), she switched gears. "Learning what the organization stood for — increasing culturally responsible Black engineers who excel academically, succeed professionally and positively impact the community — changed my point of view. Engineering became an option I wanted to explore."

She decided to major in industrial and systems engineering. "I wanted to collaborate, make people's lives easier and help solve problems, which is what industrial engineers do," she says. While pursuing her degree, she deepened her involvement with NSBE and connected with the UW's Women in Science & Engineering program. She also stayed involved with Making Connections as a volunteer.

After graduating in 2012, Hassan accepted a job at Boeing — where she'd interned — as an industrial engineer on the 777 program. She earned a UW master's degree in supply chain transportation and logistics while working full time, then was hired as a process engineer at Amazon.

But just a month later, at age 28 and with a career on the rise, Hassan faced the biggest challenge of her life: She was diagnosed with stage 2 breast cancer.

Cancer and community

Dr. Patricia Dawson, a breast cancer specialist, surgeon and UW clinical assistant professor, led Hassan's care team. "I loved her the moment I met her," Hassan says. "We just clicked. I felt grateful that she was on my side, and I didn't even know her."

Hassan wasn't yet aware of an amazing coincidence: Dawson was a founding mother of Making Connections.

"I couldn't believe it," recalls Hassan, who learned about the twist of fate from Making Connections program director Senait Habte. "This woman helped establish the program that shaped the course of my life, and now she was helping me navigate a way through cancer."

Hassan assembled a rigorous treatment plan with her care team, including family, friends and the Cierra Sisters — a support group for African American breast cancer survivors. "The engineer in me couldn't be still," she says. "I put all of my project management, research and communications skills to work for my health." She went through aggressive chemotherapy, a lumpectomy and 35 rounds of radiation therapy.

She recalls one of her final appointments. "I'd been fighting hard, and I was exhausted, I asked Dr. Dawson, 'When will I ever be able to say I'm cancer-free?' She looked at me and said, 'You can say it right now.'"

The surgery and treatments had successfully removed the cancer.

"Everything inside me just let go," Hassan reflects. "As soon as she said those words, I broke down in tears. I praised God and hugged Dr. Dawson and my sister Anisa."

"I want to show up"

"I reflected a lot while going through treatment," Hassan says. "Academics, career and community had been my guideposts through life, and I began asking myself how I could help build them for others."

Hassan moved into a new project-management role and got involved with Amazon's Future Engineer program, which helps establish robotics clubs in K–12 schools serving underrepresented communities; Hassan helped launch one at Seattle's Rising Star Elementary School. She also returned to Making Connections, encouraging young women to pursue STEM.

Last year, the Women's Center honored Hassan with its Alumna of the Year Award. Dawson, who became UW Medicine's medical director for healthcare equity in 2018 and has served on the Center's advisory board since 1993, presented it to her.

"I felt like I should've been the one giving her an award," Hassan recalls. "She saved my life. She was the reason I was able to be there at that moment and the reason I'm doing what I do today."

Inspired by her experiences and by women like Dawson and the Cierra Sisters — whom she still visits at the group's meetups — Hassan realized her passion for paying it forward.

"I often ask myself, 'What more can I do?' and the answer is 'Lots,'" she says. "Someone has always been there for me; I want to be there for others. I want to show up."

Opposite page: Ayan Hassan. Photo by Chloe Collyer / University of Washington

This page: Hassan, left, hugs Patricia Dawson upon receiving the 2019 Alumna of the Year Award from the UW Alene Moris Women's Center. Photo by Melay Kiflom

Today's ENGINEERING STU

UW photographers share some of their favorite examples of hands-on engineering education.

PHOTOS BY MARK STONE AND DENNIS WISE / UNIVERSITY OF WASHINGTON

The nature of engineering education has changed dramatically. A generation ago, undergraduates attended lectures then studied on their own. Today's education focuses on project-based learning — hands-on research, design challenges, crossdisciplinary teamwork — activities that require different kinds of spaces. The pandemic pushed us to chart new territory as we moved to remote instruction. Our faculty, staff and students rose to the challenge, as outstanding engineers do, and adapted, iterated and innovated. Many of those innovations in education delivery will transform engineering education long beyond the pandemic; however, the fundamental need for hands-on experiences remains.

In 2019 the Washington State Legislature invested in the design of a new engineering facility — a critical step in our public/private campaign to build an interdisciplinary teaching and research building. There's much more work ahead to construct this building: As we strive to meet increasing student demand for an engineering education — and industry demand for qualified engineers — we hope to have your support.

While we certainly need to grow, we are grateful for the experiential opportunities already available to our undergraduates, many of which would not exist were it not for our donors and partners. Since 2016, campus photographers Mark Stone and Dennis Wise have been documenting the engineering student experience. Here, Stone and Wise have selected some of their favorite photos. From research labs and study abroad programs to capstone projects and makerspaces, these images illustrate how our students are preparing to become tomorrow's engineering leaders.

Engineering education provides not just technical skill development but a framework for problem-solving through hands-on, collaborative learning opportunities. While some of these opportunities are on hold due to COVID-19 restrictions, we look forward to resuming them in-person as soon as we are able. In the meantime, we will continue to dream big and plan for even more creative, engaging, experiential opportunities. We hope you will join us.

RESEARCH LABS

Here, Bioengineering (BioE) undergrads construct point-of-care tests to detect HIV infection and drug resistance. BioE Ph.D. candidate Nuttada Panpradist developed the diagnostic device for her doctoral research. “Clinics in developing countries don’t always have access to labs and equipment like we have in the U.S., and they’re often trying to serve more people than they can reasonably accommodate,” Panpradist said in 2017. “If our team can introduce a low-cost, easy-to-use device to provide immediate diagnosis and resistance detection, then we can start to make a real difference in global communities.”

“What I remember most from this shoot was the sense of community — the kind that allows students to thrive,” Stone recalls. “And the devices, samples, gloves and safety glasses were purple and gold to show the students’ Husky spirit.”

DENT EXPERIENCE

CAPSTONES

ElectroSolar Oxygen, a team of Chemical Engineering (ChemE) undergrads, developed a way to generate medical oxygen for use in remote and underserved areas using renewable energy sources. The group came together through ChemE’s Special Design capstone program. “The team was rebuilding the pump during this photo shoot,” Wise remembers. “Everyone showed up with a ‘we-can-do-it-so-let’s-get-it-done’ attitude, which was pretty inspiring.”

In 2019, ElectroSolar Oxygen took home awards from the Buerk Center for Entrepreneurship’s Environmental Innovation Challenge and Dempsey Startup Competition. They also received the Ray & Priscilla Bowen Award for Process Design, which ChemE presents annually to an outstanding capstone design team.

CLUBS AND TEAMS

Engineering clubs, such as Human Powered Submarine, help students develop teamwork and leadership skills while working on hands-on engineering projects. In 2017, the club partnered with the Northwest School of Wooden Boatbuilding to design “Knotty Dawg,” a sub that honored traditional wooden boatbuilding. That summer, the team won first place in the fastest two-person competition at the International Submarine Races with a speed of 3.27 knots.

These subs aren’t watertight so pilots and dive team members must be scuba-certified. For this shoot, Wise and Stone suited up and joined them in the pool.

MAKERSPACES

Makerspaces such as The MILL, shown here, give students a place to collaborate, innovate and create. Students have access to cutting-edge professional equipment and training, workshop space, an educational wet lab and more. A collaboration between the College of Engineering and UW Housing & Food Services, The MILL — which opened in 2018 — is the second residence hall-based makerspace on campus. The other, Area 01's Dabble Lab, opened in 2015. Residence hall-based makerspaces like these make it even more possible for students to practice engineering together in their living communities.

"You can let your imagination run wild in a campus makerspace like The MILL," Stone says. "They contain many cool pieces of equipment like ceramic 3D printers, laser cutters, vinyl printers and sewing machines, and they're accessible to students for personal projects and class assignments."

DISCOVERY DAYS

"For me, Engineering Discovery Days is ultimate UW," Stone says. "Not only does it showcase the great work students are doing across the College, it gives them an opportunity to share their passion with younger audiences. The wonderment on kids' faces is priceless, especially when you see them make the connection that in a few years they could be the UW students developing these cool innovations."

Here, an Allen School undergrad introduces a group of middle schoolers to Hobbes, a PR2 robot from the Sensor Systems Laboratory. Hobbes could solve a Rubik's Cube using AI, computer vision and novel sensing technology. Students were invited to challenge Hobbes to determine who could solve the puzzle faster.

STUDY ABROAD

Peering into a large open well located on the outskirts of Bangalore, India, students participating in Civil & Environmental Engineering's Grand Challenges Impact Lab (GCIL) study abroad program learn about the local water crisis. A modern, high-tech city, Bangalore is expected to run out of groundwater by 2023. The GCIL program empowers students to turn knowledge into impact by working on some of the century's most pressing problems, from food insecurity to water scarcity to a lack of adequate housing and education.

INCLUSIVE ENGINEERING

In Mechanical Engineering (ME)'s Ability & Innovation Lab, directed by ME associate professor Kat Steele, students design assistive and orthotic devices to enrich the lives of individuals who depend on them. In 2016 the team partnered with six-year-old Jayna Doll, left, pictured here with then ME student Bradley Wachter, right. Jayna had gone through a hemispherectomy, a procedure where half of the brain is removed to alleviate seizures. After the surgery, she experienced impairment of her wrist and fingers, so Wachter and others designed a 3D-printed orthosis to stabilize her wrist and assist her in tasks like grasping markers and drumsticks and playing with toys.

COLLABORATIVE LEARNING

"I wanted to be an engineer to prove to myself that I could do it and to show other Black girls that they could, too," said Human Centered Design & Engineering student Twesone Melaku in 2017, pictured here with classmates Tsuki Kaneko-Hall and Jason Chen. Melaku, who graduated in 2018, is returning to the UW this fall after working in industry for two years to begin a graduate program in education policy and leadership.

"This shoot was a lot of fun," Wise remembers. "It was so hot that day, but the students still brought so much energy! In the end, I was ready to join them in making affinity diagrams and storyboards."

PROTOTYPE SHOPS

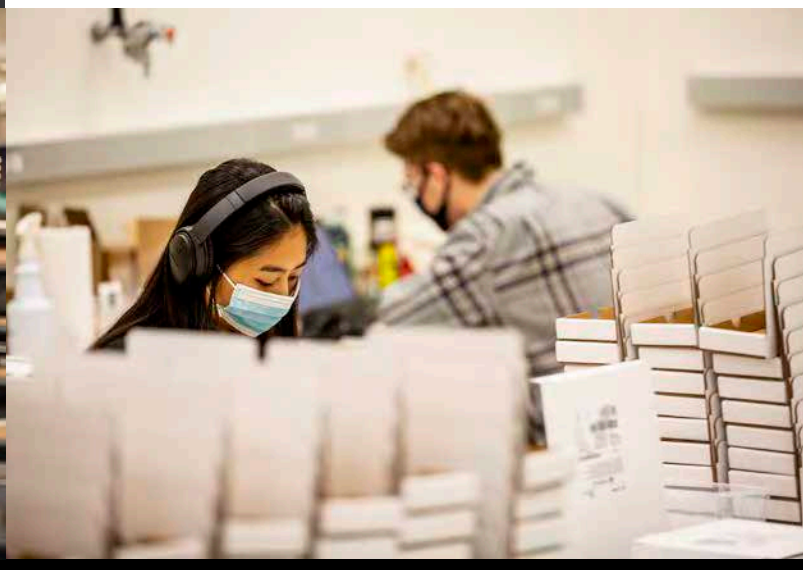
Engineering prototype shops, such as Aeronautics & Astronautics' Charlie Bossart Machine Shop shown here, offer students a wide array of fabrication and testing equipment and machining tools. These resources help students learn by doing, inviting them to put into practice concepts from the classroom.

"Students can create from scratch formula-style racecars, rovers for simulated Mars missions, hybrid rockets, and more through collaboration, inventiveness and the machine shops," Stone says.

CARING FOR THE COMMUNITY

In March 2020, as UW campuses went remote to align with Washington's "Stay Home, Stay Healthy" order, many engineering researchers pivoted their work to address COVID-19. Some had been been developing home test kits for the flu as part of the multi-institution Seattle Flu Study (SFS), which became the Seattle Coronavirus Assessment Network (SCAN) to serve the Public Health – Seattle & King County coronavirus response.

Students volunteered to assemble COVID-19 test kits for distribution through SCAN in a temporary fabrication center that was set up in the UW's Nanoengineering & Sciences Building. "The researchers worked around the clock and in shifts to get as many of these kits assembled as possible," Wise says. "They ramped this up in no time at all." The team produced nearly 8,000 SCAN kits in its first two weeks.



Building for the Futur

WHILE THE UW'S "BE BOUNDLESS" CAMPAIGN HAS ENDED, THE NEED FOR PHILANTHROPIC INVESTMENT IN THE FUTURE OF ENGINEERING EDUCATION CONTINUES. A TOP PRIORITY FOR THE COLLEGE OF ENGINEERING IS THE CONSTRUCTION OF A NEW, INTERDISCIPLINARY ENGINEERING BUILDING ON STEVENS WAY.

Since 2009, the College has grown more than 65% in total degrees granted annually. However, despite creatively leveraging existing space across campus, our student-focused facilities footprint has not grown comparably, leading to a space shortage. The need to upgrade existing facilities and construct new ones is critical: The College continues to turn away large numbers of qualified students because we simply don't have the space to accommodate them.

In addition, responding to the needs of our students, we launched Direct-to-College (DTC) admission in 2018, allowing more than 800 new first-year students to join the College as engineering majors each year. DTC admission gave us a profound opportunity to transform and improve the student experience from the moment freshmen step onto campus. In particular, we are providing students with exposure to the full range of engineering disciplines right away, while supporting more project-based learning, interdisciplinary teamwork, improved diversity, increased symbiosis with industry, and more — all to prepare our students for the engineering careers of the future.

Looking ahead, the demand for engineering degrees will increase even through challenging economic times: While five of the top 10 first-choice majors of UW incoming freshmen are in engineering, Washington ranks 47th in the nation in the production of engineers, based on the size of our engineering workforce. To meet the needs of our students and fuel the state's economy, the UW must educate more engineering students, and more space is needed for us to do so; specifically, space that enables collaborative, project-based learning.

To that end, the College is now fundraising for private gifts in support of $100 million in facilities improvements, to include a new building for all engineering students — the Interdisciplinary Engineering Building (IEB) — as well as upgrades to existing, outdated facilities. This initial college-wide, student-focused effort will level the playing field regarding students' early experiences with different disciplines, since these will now happen in common space. This project is devised as a public-private partnership, toward which we are working closely with the State of Washington to request a total of $45 million in funding to be matched with internal resources and private gifts.

UW Engineering's goal is to grow not only in terms of numbers, but to become more inclusive, collaborative, innovative and adaptable, with programs supported by facilities rivaling or exceeding those of our peer institutions. Our new learning environments will:

- Enable us to grant more UW Engineering degrees to talented Washington students;
- Provide an educational "home" for cross-disciplinary courses and programs;
- Encourage interactions that are critical to sparking new ideas;
- Develop students' talents in premier teaching and learning spaces, laboratories and makerspaces;
- Introduce students to the full spectrum of engineering disciplines and the impact various careers can have on the world; and
- Facilitate engineering discovery in state-of-the-art faculty labs and office space.

Images (these pages and cover) courtesy of McGranahan Architects.

e of Engineering

By providing the silo-free learning environments that students need to prepare for industry and entrepreneurial careers in collaboration with fellow students across campus, the IEB will relieve pressure on the College's departmental buildings. The IEB will also benefit all departments by better preparing first-year students to matriculate into majors and supporting student participation in interdisciplinary research and projects that offer exceptional opportunities to develop real-world engineering and leadership skills. Dedicated space for industry-sponsored capstone projects will strengthen connections between the UW and industry. The new building will also house programming for leadership, diversity and access.

In the words of Dean Nancy Allbritton, the building will serve as "engineering central" — providing the spaces needed to educate students to solve major societal challenges such as the country's decaying infrastructure, natural disasters, food and water insecurity, pandemics and more. Finally, situated in a prominent location on campus, this building will highlight the importance of engineering and reflect the leading-edge education the College provides.

The state has approved design funding for the project, and the challenges posed by the pandemic and the resulting economic contraction only make this project more vital. At their spring meeting, the Board of Regents unanimously approved the College moving forward with design for the IEB, with the strong advocacy of UW President Ana Mari Cauce. Currently, we are working to select construction and design partners and develop details about learning spaces, student program offices and labs.

Private philanthropy will be a key indicator of our success with the forthcoming legislative request for funding. Fundraising kicked off in 2019 with significant pledges from Tom and Lourdes Delimitros, Ron and Sheila Litzinger, Pat Shanahan, and the family of Paul Liao. We hope the UW Engineering community will join us in this endeavor.

Learn more about our plans and how you can help transform engineering education at

engr.uw.edu/facilities

THE INTERDISCIPLINARY ENGINEERING BUILDING WILL ADD:

- Flexible classrooms designed for active learning
- Curriculum lab space — classrooms with specific types of lab equipment required for accreditation
- Hands-on learning spaces
- Project space with movable furniture and open floor space, to enable hands-on learning from design to solution
- Dedicated informal gathering space for students to meet, study and collaborate
- Research lab space for faculty and student teams
- Offices for faculty and student support staff

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BE BOUNDLESS
FOR WASHINGTON | *FOR THE WORLD*

EVENTS

The following is a sample of upcoming free online events in the College of Engineering.
For more, visit engr.uw.edu/calendar or contact departments directly.

Edward Wenk, Jr., Endowed Lecture in Technology & Public Policy

Civil & Environmental Engineering

OCT. 6, 3:30 P.M. via Zoom
ce.washington.edu/news/lecture/wenk

Elizabeth Housler is the co-founder and CEO of Build for Change, an organization that improves the earthquake resilience of emerging nations by working with communities to develop low cost, sustainable and disaster resistant houses, schools and businesses that are culturally appropriate and employ local construction practices and materials.

College of Engineering Lecture

Contact Tracing: Fighting COVID While Respecting Privacy

OCT. 21, 5:00 P.M. via Zoom
engr.uw.edu/lectures

Allen School associate professor Stefano Tessaro explains the benefits and drawbacks of contact tracing, its widespread use, and digital contact tracing methods being developed at the UW to protect the privacy of individuals.

How is Getting an Engineering Degree like Learning How to Fly Upside Down?

Human Centered Design & Engineering

OCT. 27, 5:30 P.M. via YouTube
hcde.uw.edu/aragon-flying-free

HCDE professor Cecilia Aragon talks about overcoming self-doubt in an engineering career, shares her experience as a software engineer in industry and academia, and reads excerpts from her memoir, *Flying Free: My Victory Over Fear to Become the First Latina Pilot on the US Aerobatic Team.*

Burges Endowed Visiting Professorship Lecture

Civil & Environmental Engineering

NOV. 5, 3:30 P.M. via Zoom
ce.washington.edu/people/visiting-faculty

A lecturer at the University of California, Berkeley, Khalid Kadir teaches in the Global Poverty & Practice program. His research, teaching and engineering practice addresses the intersection of water, sanitation, politics and policy.

The Dean W. Lytle Endowed Lecture

Electrical & Computer Engineering

NOV. 19, 3:30 P.M. via Zoom
ece.uw.edu/news-events/lytle-lecture-series/

This lecture — ECE's premiere annual event — features renowned researchers in communications, signal processing, control systems and machine learning. This year's speaker is Scott Aaronson, computer science professor and Quantum Information Center director at University of Texas at Austin.

Save the date

Engineering Exploration Night

JAN. 13, 2021

Alumni and students connect to discuss engineering careers and fields. Students meet with a diverse group of industry professionals in a "speed date" format. Each year, we seek engineering alumni from all disciplines.

Interested in participating? Email Zoe Bartholomew at zfinnb@uw.edu