

The M_Essenger

NEWSLETTER

Engineering Innovation in Health
program sparks collaboration

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CHAIR'S MESSAGE

Greetings! As the academic year winds down and our students head out for the summer, I'm excited to share updates with you from a busy year. I'd like to acknowledge our outstanding faculty and staff, several of whom received awards this year, which you'll read about in this issue. You'll also meet our newest faculty member, Corie L. Cobb, whose expertise in clean energy, novel manufacturing and design will expand ME's research in these areas.

Thanks to unique academic-clinical-industry collaborations, we continue to be a leader at the UW in health technology and innovation. Through programs such as Engineering Innovation in Health (EIH), students work alongside clinicians and engineering faculty to create medical devices to address today's most pressing health problems. This issue's feature story highlights five projects that originated through EIH and continue to build momentum as teams move their devices through the commercialization process. You'll read about one ME student's journey along this path — what it's been like to develop an idea and see it through to patenting.

Whether in health care, energy, manufacturing or one of the many other areas of ME, educating tomorrow's leaders is our highest priority. We're honored to celebrate our graduating students in the Class of 2017 and wish them the best in their future endeavors.

Per Reinhall
Mechanical Engineering Chair



Welcome Corie L. Cobb to ME faculty

Corie L. Cobb joined us this spring through a Washington Research Foundation Professorship in Clean Energy. She holds a joint position in ME and the Clean Energy Institute.

She comes to the UW from Palo Alto Research Center (PARC), Inc. where she was a Senior Member of Research Staff leading projects on advanced manufacturing technologies for solar cells, batteries and high strength and toughness materials. At PARC, Cobb specialized in computational analysis, hardware design and process development for printing and patterning of multi-functional materials. Prior to PARC, she was a mechanical design engineer at Applied Materials and held positions at Hewlett-Packard, Bell Labs, Google and Toshiba.

Cobb received her Ph.D. in mechanical engineering from the University of California, Berkeley, in 2008. She holds a master's degree in mechanical engineering ('04) and a bachelor's degree in product design ('02) from Stanford University.



The longer-term focus of Cobb's research at the UW is to investigate novel manufacturing and design methods that enable next generation energy devices and materials with unprecedented performance and capabilities.

Faculty awards

Nicholas Boechler received a Department of Defense University Research Instrumentation Program grant for a laser-induced shock visualization and ballistic impact system.

Steve Brunton is part of a five-year \$6 million Multidisciplinary University Research Initiative (MURI) grant and will collaborate with researchers at five universities to investigate how to use data-driven methods to embed nonlinear dynamical systems in a linear framework. He also received the 2017 College of Engineering Faculty Award for Teaching.

Ashley Emery, in conjunction with a UW Medicine's Surgery team, has been awarded a three-year \$1.5 million grant from the Army Research Office to study therapeutic limb cooling to prevent amputation due to tourniquets.

Vipin Kumar and his research team won an Amazon Catalyst grant to develop a 3-D printer to print air bubbles.

Four projects, led by **Jonathan Liu**, **Jonathan Posner**, **Eric Seibel** and **Katherine M. Steele**, were awarded 2016 Innovation Fund Grants from UW CoMotion.

Ramulu Mamidala received a grant from JDCREAM for a 3-D titanium printer for research and teaching.

Igor Novosselov's research group has received a Department of Defense grant to develop a supercritical water reactor for the neutralization of chemical agents. Novosselov was also awarded a Gates Foundation subcontract to develop new tools for polio virus detection.



STUDENT NEWS

Graduate student **Guarav Mukherjee's** team NEOGrasp won this year's Neural Engineering Tech Studio Competition, hosted by the Center for Sensorimotor Neural Engineering. A low-cost neural orthosis, NEOGrasp allows users who are quadriplegic or tetraplegic to use another muscle to control a device that can grasp and release objects.

Graduate students **Michael Rosenberg** and **Andrew Bender** received National Science Foundation (NSF) Graduate Research Fellowships. This fellowship program supports outstanding graduate students in science, technology, engineering and mathematics.

Undergraduate **Bradley Wachter** and graduate student **Jessica Zistatsis** were named to the 2017 Husky 100 cohort. The Husky 100 recognizes students who are making the most of their time at the UW.

The **UW Hyperloop team** placed 4th at international competition this winter at SpaceX headquarters in Hawthorne, California.

The **UW EcoCAR 3** team won several awards at this year's national competition, including the NSF Innovation Award and Most Creative Outreach Event Award. Undergraduate team member **Rachel Krause** received the General Motors Women in Engineering Rookie Award.

ME External Advisory Board

Thanks to the following alumni and friends for participating on this year's advisory board:

David Barr, Director, Boeing Programs, Hexcel

Jon Bishay, Bardy Diagnostics

Anders Brown, '92 BS, '94 MS, President, Radius, Inc.

Steve Chisholm, '86 BS, The Boeing Company

Stanley Gent, President and CEO, Seattle Steam Company

Carl Hergart, Director of Advanced Powertrain, PACCAR

Peter W. Janicki, '89 MS, President and CEO, Janicki Industries, Inc.

Michael C. Kintner-Meyer, '94 Ph.D., Energy-Environment Directorate, Pacific Northwest National Laboratory

Paul Leonard, Principal, Leonard Consulting, LLC

Tom Loutzenheiser, '83 BS, Executive Vice President of Business Development, PRECO Electronics

Jill McCallum, President, Pacific Rim Aerospace Corporation

Hamid Mortazavi, '82 MS, '89 Ph.D., Research Specialist, SEMS/Corporate Research Lab

Ron Prosser, '70 BS, Chairman and CEO, Green Charge Networks

James M. Reichman, PACCAR, Inc. (retired)

Donald Sandoval, '91 MS, '95 Ph.D., Senior Research Physicist, Los Alamos National Laboratory

Robert K. Schneider, '71 BS, '73 MS, '76 MBA, President, D. Hittle & Associates, Inc.

K. Michael Sekins, '81 Ph.D., Director of Applications, Innovations Department, Ultrasound Division, Siemens Medical Solutions USA, Inc.

Fred Silverstein, '72 M.D., UW Clinical Professor of Medicine, Gastroenterology, and General Partner, Frazier & Co. (retired)

John T. Slattery, Vice Dean for Research and Graduate Education, UW School of Medicine

Tim Stearns, '90 BA, Senior Energy Policy Specialist, State Energy Office, Washington State Dept. of Commerce

Al Stephan, '82 BS, CEO, Stratos Biosystems LLC

Tina Toburen, '92 BS, '94 MS, T2E3 - Energy Efficiency Enterprises

Gil Wootton, '89 BS, Accenture



Engineering Innovation in Health: Transforming education in health technology design and entrepreneurship

Never before have we faced more complex health care challenges — or more exciting opportunities — to save more lives, reduce costs and improve care through cutting-edge technology. Through cross-disciplinary collaboration and entrepreneurship, ME's Engineering Innovation in Health (EIH) program provides a framework for engineering students and faculty to partner with clinicians and develop affordable solutions to today's pressing health needs.

"We started EIH in 2013 because we saw the disconnect between engineers and clinicians as directly impacting health care costs and innovations," says ME professor and chair Per Reinhall, who worked closely with ME associate professor Jonathan Posner and members of the ME's external advisory board to develop the program.

"We all agreed that this was an opportunity for a change in the culture," adds Posner. "EIH's goal is to prepare the next generation of students and faculty in medical device development and innovation while establishing a multi-disciplinary culture of engineers and health practitioners."

Through EIH, students are coached in advancing their devices through initial stages of design and prototyping to generate patents, data for publications and grant applications, and — ultimately — to introduce their innovations to market.

Collaborations across industry and campus are central to EIH. Doctors, nurses, physical therapists, dentists and pharmacists present EIH with challenges they face in practice. A review committee assesses and selects projects that seem like a good match for the program's interdisciplinary student teams. Projects and deliverables are managed within a year-long design course sequence: fall quarter is dedicated to deepening an understanding of the clinical need and device

design, winter and spring to prototyping and evaluation. Projects are assessed at the end of fall quarter; those that demonstrate the most potential are encouraged to move forward through winter and spring quarters for full development. Clinician-faculty-student teams work together from beginning to end and submit their devices to UW CoMotion for U.S. patent consideration. Once they complete the program, EIH teams may continue to refine their devices and move toward commercialization.

EIH by the numbers, 2013-2017

- 200+** Students enrolled since EIH began in 2013
- 100+** Clinical partners from institutions such as UW School of Medicine, UW School of Dentistry, Seattle Children's Hospital, UW School of Nursing and Providence Health & Services
- 80/20** percentages of undergraduate and graduate students who participate in EIH
- 75** Total projects introduced through EIH
- 10+** Provisional patents for devices that emerged through EIH
- 9** UW departments represented through student involvement
- 3** Projects in early stage commercialization

Learn more at EIH's new website: eih.uw.edu

Innovation and collaboration

We highlight five projects that originated through EIH and are still building momentum.

EpiForAll

An affordable alternative to the epinephrine auto-injectors currently on the market, these devices are used to treat anaphylaxis, a potentially life-threatening allergic reaction. This team has developed a version for low-resource communities worldwide that utilizes readily available, low-cost epinephrine ampules.

EpiForAll placed first in the UW Buerk Center for Entrepreneurship's Hollomon Health Innovation Challenge (HIC) this year and fourth in the Center's Business Plan Competition. Teammates are working with UW's Entrepreneurial Law Clinic to form a company and have filed for a utility patent through UW CoMotion.

MistEase

Glaucoma is the second leading cause of irreversible blindness, and elderly patients often find it difficult to take their eye medications due to limitations in dexterity and vision. MistEase is a device that makes it easier for elderly people to administer their eye drops.

MistEase has been approved for clinical study and is being tested with patients.

Quinton PSH (Parastomal Hernia Support Harness)

Patients who have undergone gastrointestinal stoma surgery are at high risk for developing hernias. They can reduce this risk by wearing specially designed support belts, but those currently on the market tend to be uncomfortable and difficult to wear. Building upon work of noted UW bioengineering pioneer and ME alumnus Wayne Quinton, BSME '58, the team has designed an easy-to-wear support harness that stays in place as its user moves throughout the day.



PlayGait™

Children with gait disorders get limited walking practice with the correct gait pattern outside of physical therapy, which can slow their rehabilitation rate. PlayGait™ is a pediatric exoskeleton that helps children with gait disorders walk more, so they can build muscle strength and increase independent mobility.

Since completing EIH, the team has received \$95,000 in grants to support research and development and has filed a provisional patent through UW CoMotion. Team members won third place at this year's HIC and competed in the Buerk Center's Business Plan Competition. They are currently preparing to test with patients and are planning for a controlled initial product release in 2018.

The team has filed for a provisional patent and is planning to test with patients through a clinical study at UW Medicine.

ACBI (Automated Continuous Bladder Irrigation)

Patients who undergo prostate or bladder surgery may develop blood in their urine. If untreated, a blood clot may form, making it difficult or, in some cases, impossible for patients to urinate. Continuous Bladder Irrigation — the current process to keep the bladder free of blood clots — is labor- and time-intensive. This team's device automates the process of managing saline flow, assessing blood levels and alerting nurses of irregularities.

Team members continue to work on developing their prototype. They are looking for commercialization partners and funding opportunities to support their work.

From idea to innovation

For graduate student Jessica Zistatsis, Engineering Innovation in Health (EIH) introduced boundless opportunities in health care innovation. Jessica is one of the innovators of PlayGait™, a pediatric exoskeleton that helps kids with cerebral palsy get more walking practice outside of therapy so they can learn to walk independently.

Jessica's goal is for PlayGait to be ready for market by the time she completes her MSME in 2018. She has secured a patent for the device and \$95,000 to further research and development. She recently spoke with us about her journey through the commercialization process at the UW, thanks to EIH.

Why did you decide to study ME?

ME allows me to combine my interests in math, physics and design with my desire to help people. My vision is to engineer solutions that change people's lives so everyone has access to the same opportunities at work, school, home and in the community. EIH has shown me that I can bridge engineering, health care and entrepreneurship.

How did the idea for PlayGait come about?

Brian Glaister of local medical device company Cadence Biomedical and ME professor Kat Steele proposed the idea to EIH. Cadence Biomedical makes exoskeletons that help adults with neurologic conditions walk, and they saw a need for similar devices for children. Before we began designing, my team worked closely with Brian during our first quarter to understand market need and interview potential stakeholders — physical therapists and parents of kids with gait disorders. We then spent winter and spring quarters deep in component prototyping, testing and documentation.

What's it been like to work with health care and industry partners?

We partnered with Kristie Bjornson, a physical therapist at Seattle Children's Hospital who works with children with cerebral palsy. Her expertise helped inform PlayGait's design specifications. At Cadence Biomedical, Brian works with a similar customer base, and since PlayGait follows a similar regulatory and reimbursement process to that of his device, he has been able to offer valuable guidance.

EIH also connected our team with UW CoMotion. CoMotion helped us file a provisional patent for PlayGait's intellectual property and discover external funding opportunities.

Why did you decide to continue developing PlayGait after you completed EIH?

Because I believe that PlayGait has the potential to transform kids' lives. I want to get PlayGait to a place where a medical device company will be able to license and mass-produce it. This project has given me so much purpose; how could I not see it through to market?

What's been your favorite part of this journey toward commercialization?

Thanks to EIH, I've been able to work on a "real world" project with health care professionals, industry partners, patients and their families. I'm developing a device that will have big impact on children, and that feels amazing.

I've also discovered a passion for entrepreneurship. I even started taking business development classes outside of ME. I don't know if I would've realized my interest in business had it not been for EIH.





Devin MacKenzie to lead new clean energy testbeds

ME professor J. Devin MacKenzie will lead the Washington Clean Energy Testbeds, which were opened by UW's Clean Energy Institute (CEI) to accelerate the development, scale-up and adoption of new energy technologies in solar harvesting, energy storage and grid integration. The state-of-the-art facility has labs for manufacturing prototypes, testing devices and integrating systems. CEI unveiled the Testbeds at a celebration with Washington Gov. Jay Inslee, cleantech leaders and researchers on February 16.

A seasoned cleantech entrepreneur and expert in electronic materials and emerging manufacturing methods for energy devices, displays and communication, MacKenzie has founded and led five startup companies and holds over 110 patents and publications. In addition to leading the Testbeds and teaching at UW, he is currently the chief technical officer of Imprint Energy, a UC Berkeley spinout developing flexible, high-energy batteries based on large-area print manufacturing. He holds a joint appointment with materials science and engineering and is a Washington Research Foundation Professor in Clean Energy.

At the Testbeds, MacKenzie manages a staff of trained experts in fabrication and analysis of energy systems and devices. They work on-site to train users from academia and business and support research and development efforts.

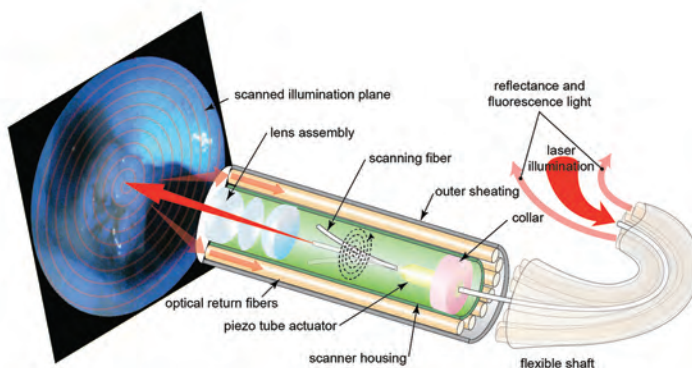
"CEI's vision for an open-access clean energy testbed model based at a world-class university with an innovation focus brought me from the Bay Area to Seattle," said MacKenzie. "I'm thrilled to help foster a community of distinguished faculty, bright students and cleantech businesses that will work together to create solutions for a healthy planet."

Laser-based camera improves view of the carotid artery to monitor for stroke and heart attack risk

Strokes and heart attacks often strike without warning. But a unique application of a medical camera developed by ME research professor Eric Seibel could one day help physicians know who is at risk for a cardiovascular event by providing a better view of potential problem areas.

UW and University of Michigan researchers reported proof-of-concept results earlier this year for this new imaging platform for atherosclerosis.

"The camera actually goes inside the vessels," says Luis Savastano, a Michigan Medicine resident neurosurgeon. "We can see with very high resolution the surface of the vessels and any lesions, such as a ruptured plaque, that could cause a stroke. This technology could possibly find the 'smoking gun' lesion in patients with strokes of unknown cause, and may even be able to show which silent, but at-risk, plaques may cause a cardiovascular event in the future."



The scanning fiber endoscope, or SFE, used in the study was invented and developed by Seibel. He originally designed it for early cancer detection to clearly image cancer cells that are currently invisible with clinical endoscopes.

The Michigan Medicine team used the instrument for a new application: acquiring high-quality images of possible stroke-causing regions of the carotid artery that may not be detected with conventional radiological techniques.

"In addition to discovering the cause of the stroke, the endoscope can also assist neurosurgeons with therapeutic interventions by guiding stent placement, releasing drugs and biomaterials and helping with surgeries," Seibel said.

MECHANICAL ENGINEERING

UNIVERSITY of WASHINGTON

Mechanical Engineering
Box 352600
Seattle, Washington 98195-2600

Per Reinhall

Department Chair

Chelsea Yates

Assistant Director of Publications

Jennifer Langston

Suzanne Offen

Science Writers

Mary Macenka

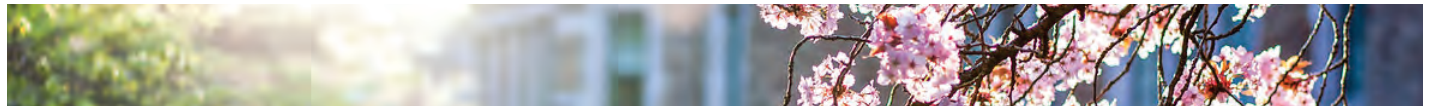
Graphic Design

Send address corrections and comments to:
mengr@uw.edu



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Allen D. Israel delivers 2017 ME graduation address

We thank **Allen D. Israel**, BSME '68, for delivering remarks at ME's 2017 graduation ceremony on June 11. Israel is a senior member of Foster Pepper PLLC, where he has practiced business law since 1978.

While studying ME, Israel was the president of the UW chapter of ASME. Following graduation, he worked as an engineer at Boeing Commercial Airplanes. He returned twice to the UW, to earn his MBA in 1971 and J.D. in 1978.

Israel has served on the College of Engineering Visiting Committee for over 20 years. In 2006, he hosted the

Mechanical Engineering Centennial Reunion Reception honoring ME classes from the 1960s. He has also served on the UW Law School Dean's Advisory Committee and the Law School Foundation Board.

An accomplished and experienced attorney, Israel shared with the ME Class of '17 his perspective on the usefulness of a ME degree in non-traditional career pathways, such as business and law.



2016-17 ME Leadership Seminar Series

Many thanks to the following alumni and friends for participating in this year's leadership seminar series:

Brian Allen, '78 BSME, CEO, ATS Automation

Rebekah Bastian, '02 BSME, Vice President of Product, Zillow

Dr. Tia Benson Tolle, '86 BSME, Director, Advanced Materials, The Boeing Company

Justin Brynestad, '03 BSME, Director of Engineering, Tass Inc.

Dan Ervin, '80 BSME, Consultant/Principal, RH2 Engineering

James Nevelle, '94 BSME, President and CEO, Kathrein USA, Inc.

Robert Peha, '83 BSME, Co-Owner and President, IDL Precision Machining

Vesna Savic, '95 BSME, '00 Ph.D., Senior Project Engineer, General Motors Corporation

Niel Skogland, '82 BSME, Principal, Eureka! Engineering

Alan Topinka, '84 BSME and BA Business Administration, Lead Thermomechanical Engineer, CASE Forensic Engineers