MechSE News

Department of Mechanical Science and Engineering

Grainger College of Engineering
UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

Summer 2020

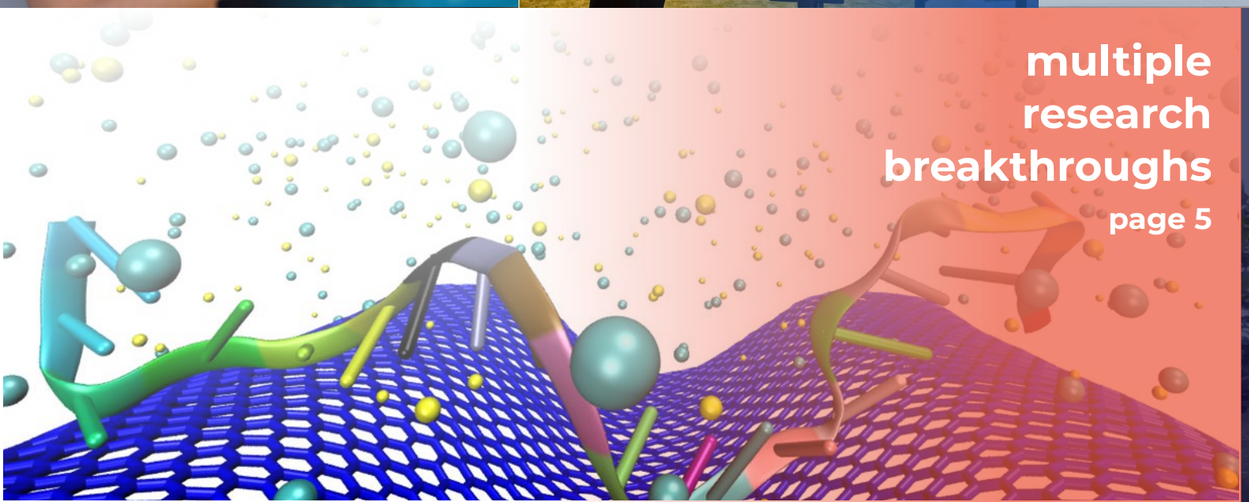
COVID-19 quick response
page 2

new research centers
page 7

ME grad rankings ascending
page 6

undergrad student impact
page 4

Lu MEB update page 8



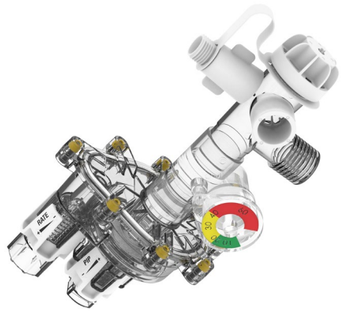
multiple research breakthroughs
page 5

graduation goes digital
page 3

alumni + adventure
page 9

COVID-19 battle: King, Saif, many others from MechSE have really stepped up

Led by Professor **William King**, an expansive team of Illinois researchers worked around the clock to meet the surge in needed respiratory care, developing the Illinois RapidVent.



The global consumer electronics leader Belkin is collaborating with Illinois researchers to manufacture it.

NBC News reports that MechSE alumnus **Kevin Hommema**'s idea spurred $415M in funding for new decontamination systems.

Graduating senior **Amanda Maher** reflected on what all the changes mean for her and several of her classmates in the COVID-19 environment.

MechSE alumnus **Neel Kashkari** told 60 Minutes what tools the Federal Reserve can use to combat the economic stress being caused by COVID-19.

Alumnus **K.R. Sridhar** was praised by California's governor for his innovative ventilator work in the COVID-19 battle.

MechSE's Machine Shop and Rapid Prototyping Lab are helping produce face shields for health professionals responding to the pandemic.

Covalence, a 2,000-strong group of students around the world, demonstrated the impact students can have through virtual collaboration.

Professor **Leonardo P. Chamorro**'s novel, highly-efficient, virus-preventive respirator mask was inspired by nasal structures of animals with enhanced olfactory sensitivity.

MechSE faculty, staff, students have stepped up in the COVID-19 battle. "These are amazingly talented engineers," Professor **William King** said.

MechSE alumnus and Duke University professor **Ken Gall**'s team is creating a powered air-purifying respirator.

In late June, the NBC Nightly News national broadcast featured Professor Taher Saif's breakthrough work utilizing T-shirt material for face masks. In a previous article, Saif explained best fabric choices for masks.

From the Department Head

Dear MechSE Alumni and Friends,

I hope this message finds you and your loved ones happy, healthy, and safe during the uncertain times of the coronavirus pandemic. Like you, we have experienced many challenges over the past four months.

In this e-magazine, we have gathered together many of our recent news stories. Even in these tough times, our faculty, staff, students, and alumni continue to amaze me with their accomplishments and can-do attitudes. As you can see in the adjacent article, many of them are even fighting the COVID-19 battle head-on!

The University of Illinois leadership has announced that classes will take place on campus this fall, with a combination of in-person and online instruction. Of course, the safety of faculty, students, and staff will always be our top priority, and proper community health protocols have been developed to safeguard MechSE classrooms, laboratories, and offices.

You may have received messages from our university leadership on other issues of concern, from visa limitations for our invaluable international students to the continuing challenges faced by our underrepresented populations. We are grateful for the initiatives the University has undertaken to address these issues, and we proudly support these efforts as we continue to build on the excellence of MechSE.

Our invitations to bring you to campus will be limited this year, but we remain extremely thankful for all you do to support MechSE. If you have any questions, please contact Alec Verone, Assistant Director of Corporate & Alumni Relations, via email at averone2@illinois.edu or by phone at (217) 265-5251. Thank you again for your generosity and support.

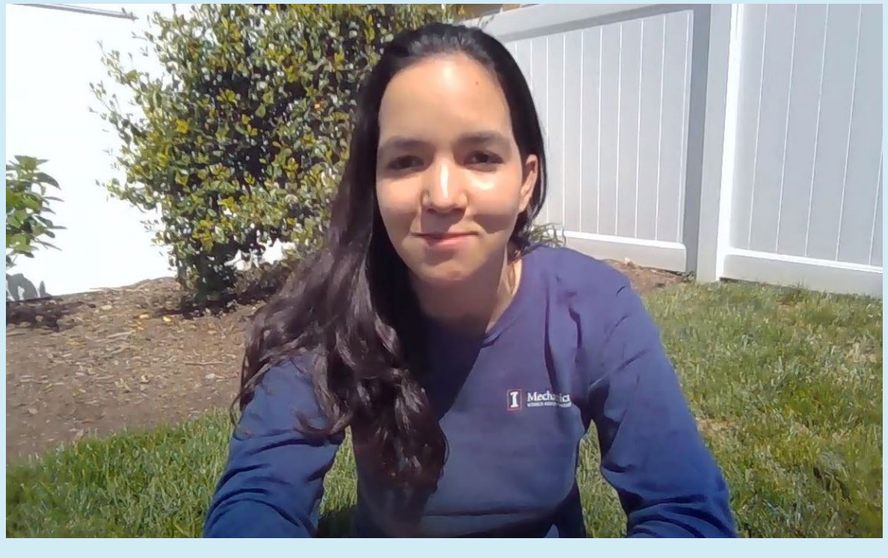
Sincerely,

Anthony M. Jacobi
Head & Richard W. Kritzer Distinguished Professor
Department of Mechanical Science and Engineering

Professor addresses academic mixed messaging

Professor **Amy Wagoner Johnson** expressed some much-needed changes in making academia a level playing ground for all in an Inside Higher Ed editorial.

"Momentum for change is building," she wrote. "What also needs to change is institutional mixed messaging, as well as the overtaxing of certain faculty and staff members. We must turn our attention to inclusion, which implies some understanding of additional burdens and systemic and sustained biases underrepresented groups face, especially those of color."



Laguna, Brown inspire at virtual commencements

Despite less than traditional graduation ceremonies this year, alumni **Valeria Laguna** (BSME '13, pictured here) and **Eric Brown** (pictured at far left of page) offered inspiring speeches to the 2020 undergraduate and graduate classes, respectively.

Watch Val Laguna's speech.

Watch Eric Brown's speech.

Five receive distinguished, outstanding young alumni honors for 2020

Eric Brown
Distinguished Alumni
BSME '98
MSTAM '01
PhDTAM '03

Lance Hibbeler
Outstanding Young Alumni
MSME '09
MSTAM '11
PhDME '14

Ritu Raman
Outstanding Young Alumni
MSME '13
PhDME '16

Jeanne Shobert
Distinguished Alumni
BSME '85

Wendy Teare
Distinguished Alumni
BSEM '88

Many ways for alumni to interact with MechSE

The MechSE Department always welcomes engagement from our alumni, corporate friends, and other supporters of our mission.

You've probably heard about our largest initiative, the **Campaign to Transform the Sidney Lu Mechanical Engineering Building**. Many opportunities for support are available to help bring this incredible facility to life.

If you are interested in impacting students' ability to join MechSE, **Engineering Visionary Scholarships** are a great way to provide significant, flexible scholarships to our students.

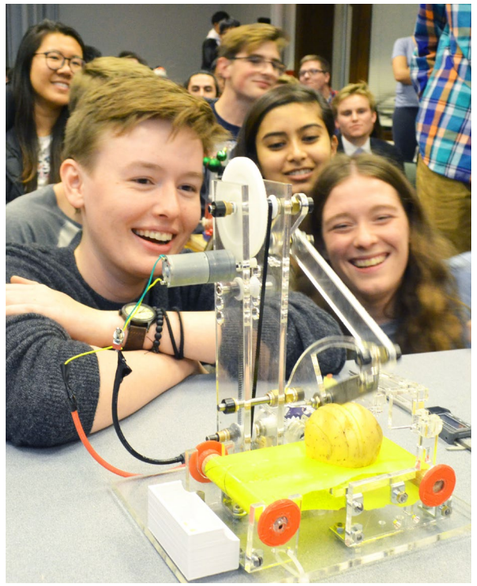
For corporations, that work with MechSE or recruit our students for internships, co-ops, and full-time positions, we invite you to work together with our student teams through **Senior Design projects**.

Alec Verone
averone2@illinois.edu

Please contact us anytime! Your first step will be reaching out to our Assistant Director of Corporate and Alumni Relations, **Alec Verone**.

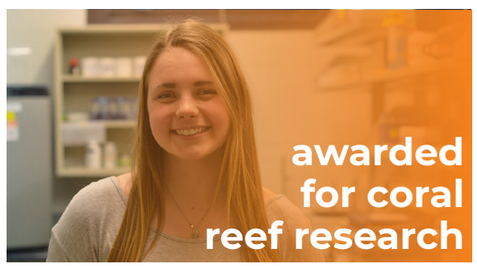
ME 370 students build slicers

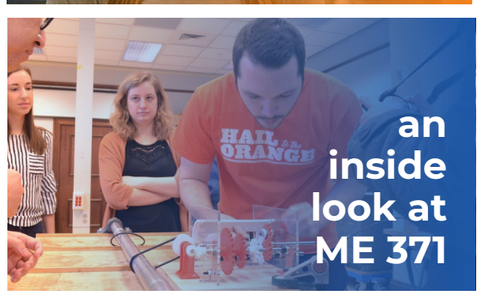
“You need to show that you can flip a switch and your machine will feed a vegetable and slice it automatically without you interfering all the time,” said Assistant Professor **Aimy Wissa**. “But then we wanted them to be designed to be versatile enough to cut a variety of vegetables.” The biggest challenges that the students faced involved perfecting the linkage design to cut through all the items as well as find the correct ratio of torque and speed for their mechanisms.



ME 470 team helps C-U citizen

Most of MechSE’s senior capstone design projects are completed for corporate sponsors or to address a mechanical issue on campus. Thanks to someone in the Champaign community reaching out, one of the Fall 2019 ME 470 projects addressed a more personal challenge: designing a custom walker for a local resident who has cerebral palsy. “She’s (currently) using a device made for children, so it doesn’t fit her properly,” said Professor **Elizabeth Hsiao-Wecksler**, the faculty advisor to the “gait trainer” student team who tackled the project.





Declassified Career Survival Guide

MechSE students and recent graduates reflect on internships, interviewing, and more.

Shail Desai elaborates on his wide range of internships, undergraduate research, and development opportunities on campus.

MechSE senior Stef Anderson spent her 2019 summer break on the west coast, interning at Viasat, Inc.

Veronica Holloway’s summer internship at Baxter Healthcare was so successful it resulted in a full-time job offer upon graduation.

Amol Rairikar hopes a mechanical engineering degree, combined with his business consulting experience, will prove to be a great combination for his future employer.

MechSE junior Anna Alvarez participated in the Cornell Nanoscale Facility (CNF) REU, where she worked in the field of nano-fabrication.

Two young alumni from MechSE, along with intern Amanda Maher, share their experiences working at Navistar.

Recent ME graduate Chris Wahlund talks about his new career in business consulting.

Madeleine Gandawidjaja was the only graduating senior on the Illinois women’s tennis team. She went on to a job at PepsiCo after graduation.

Recent research in the news

Physical force alone spurs gene expression, study reveals. **Ning Wang** is leading the research published in Science Advances.

Theory of pore-scale transport to enable improved flow batteries. **Kyle Smith** published the sole paper from an Illinois researcher in an issue of the Journal of the Electrochemical Society honoring Illinois' Richard Alkire.

AI could have electricity-level impact. **Seid Koric** says artificial intelligence will touch "every corner of life."

New capability for electronics cooling using additive manufacturing demonstrated. **William King** and **Nenad Miljkovic** have demonstrated a new type of air jet cooler that overcomes previous barriers to jet cooling systems.

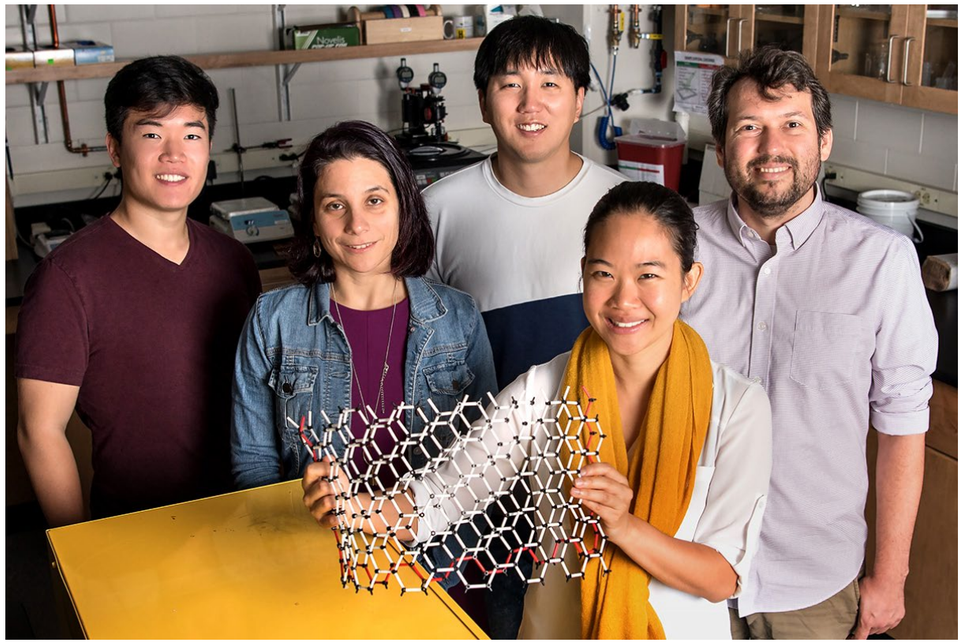
New research combines smart composite materials and digital microfluidics. **Seok Kim** aims to provide a straightforward pathway to a new digital microfluidic platform without electrowetting-related limitations.

New aerial image dataset provides farmers with actionable insights. Researchers including **Naira Hovakimyan** have developed new computer vision techniques that solve complex pattern recognition problems.

Researchers demonstrate transport of mechanical energy, even through damaged pathways. **Gaurav Bahl**'s findings were recently published in Nature Communications.

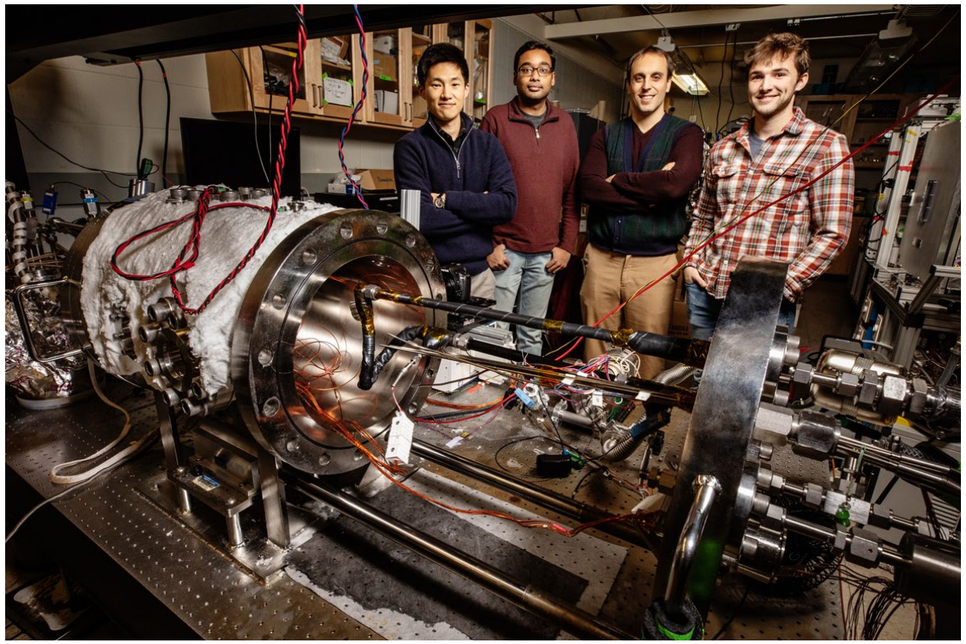
Study reveals unique physical, chemical properties of cicada wings. **Nenad Miljkovic** is part of a team researching how the insects' wings repel water and kill microbes.

Phenomenon to enhance heat transfer performance uncovered. "This work throws considerable light on cloaked condensate droplet dynamics, and how it can affect heat transfer performance," said **Nenad Miljkovic**.



Graphene: The more you bend it, the softer it gets

New research by engineers at Illinois, including **Elif Ertekin** and **Arend van der Zande**, combines atomic-scale experimentation with computer modeling to determine how much energy it takes to bend multilayer graphene – a question that has eluded scientists since graphene was first isolated. The findings are reported in the journal Nature Materials.



New understanding of condensation could lead to better power plant condenser, de-icing materials

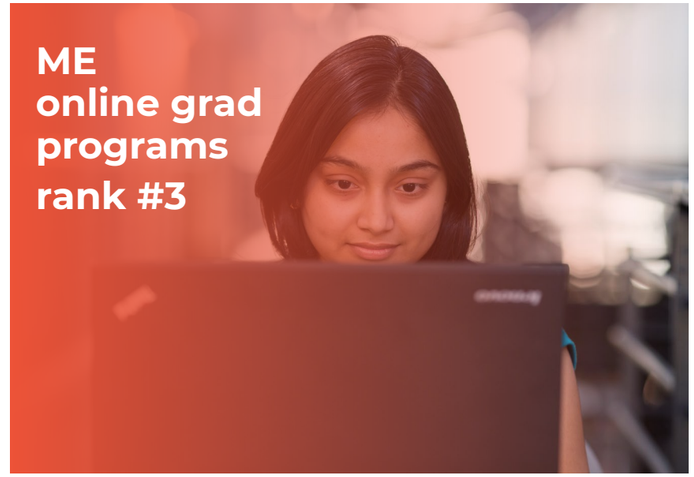
Nenad Miljkovic and colleagues show the necessity of water repellency is unclear and that the slipperiness between the droplets and solid surface appears to be more critical to the clearing of condensation. This has implications for the costs associated with power generation and technologies like de-icing surfaces for power lines and aircraft.

Master of Engineering in Mechanical Engineering

We understand that the COVID-19 pandemic has caused unprecedented challenges for many. Some MechSE alumni may be contemplating a new career course due to changes in their workplace or other unexpected factors. To help remove barriers to the industry-oriented Master of Engineering in Mechanical Engineering program at Illinois, we have streamlined the application process for MechSE alumni for the rest of 2020.

If this program is of interest to you or one of your colleagues, a great starting point is to read more on the MechSE website.

Feel free to contact Graduate Admissions Coordinator Susan Roughton or M.Eng Faculty Director Jiajun He with any questions.



Halloran goes from undergrad to NSF fellowship

Recent MechSE alumna **Kellie Halloran** (BSME ’20) was awarded an NSF Graduate Research Fellowship to conduct her doctoral studies. The fellowship will fund Halloran’s tuition and research on wheelchair biomechanics for the next three years. Halloran initially became involved in undergraduate research to gain additional experience outside of industry.

Graduate students achieving great success in MechSE

MechSE graduate students continue to conduct superior research and earn awards. Here are a few highlights:

Mahshid Mansouri was one of only four recipients of the Roy J. Carver Fellowship awarded by The Grainger College of Engineering for 2019-2020.

PhD student **Sara Moshage**, working with MechSE professor Mariana Kersh, was one of just seven from campus to be awarded a Beckman Institute Fellowship.

After graduating last year, MechSE alumnus **Sunyu Wang** (BSME ’19) chose to pursue his master’s degree in the department so he could conduct research with João Ramos.

Dhawal Thakare and other members of the Autonomous Materials Systems Group at the Beckman Institute have developed a new technique to make microcapsules that can respond to pH changes.

MechSE graduate students **Mohammad Heiranian** and **Amir Taqieddin** were two leaders of the research published in Nature Communications.

Sloan Scholarship recipient **Victoria Arias**’s graduate focus involves computational chemistry as well as micromechanics.

Juyoung Leem, who recently received her PhD in mechanical engineering, won two MRS awards and a Stanford TomKat Postdoctoral Fellowship, followed by a second-place award for Elsevier’s Carbon Journal Prizes.

To tackle the agricultural issues caused by excess fertilization, **Alexandre Barbosa** started developing four different convolutional neural network (CNN) architectures for predicting yield.

Collaborative Research Centers

ACRC
The Air Conditioning and Refrigeration Center was founded in 1988 and is currently sponsored by 30 companies. ACRC is developing a new generation of energy-efficient and reliable equipment for using environmentally safe refrigerants.

C-NICE
The Center for Networked Intelligent Components and Environments is a $100M partnership that serves as a global hub for the intelligent technologies that will drive the manufacturing plants, medical environments, autonomous vehicles, and smart homes of the future.

Center for Autonomy
Artificial intelligence and autonomous technologies are revolutionizing society, but transitioning to these systems will require fundamentally new research developments. The center pursues research projects that support autonomous systems safely and reliably.

CHESS NEW IN 2020
The Center for Hypersonics and Entry Systems Studies draws from expertise in state-of-the-art experimental facilities and high-performance computing to support fundamental advances in hypersonics and entry system technologies.

CUP
The Center for UAS Propulsion helps accelerate research in technologies – like materials, combustion, fuels, and hybrid architecture – that are critical for the development of next generation

propulsion systems in unmanned aircraft systems. Collaboration among the Army, universities, and industry is key to the center's success.

FCP
The Fracture Control Program aims to foster substantial progress and technology transfer in the area of durability modeling and materials databases.

I2CNER
The International Institute for Carbon-Neutral Energy Research is a collaboration between Illinois and Kyushu University in Japan. I2CNER has contributed significantly to the advancement of a carbon-neutral energy society.

I-MRSEC
The Illinois Materials Research Science and Engineering Center is part of the larger NSF-funded center. The research team for "Active interfaces between highly deformable nanomaterials," aims to bridge hard-material electronic design with the adaptability of nature to engineer new electronic devices that can change shape without losing functionality.

MHFCC
The Midwest Hydrogen and Fuel Cell Coalition is a partnership that is raising awareness of the potential for hydrogen and fuel cells to provide energy resilience and security, reduce emissions, and foster economic growth.

nanoMFG
The researchers' vision is to develop computational software tools aimed at creating smart, model-driven and experimentally informed nanomanufactured structures and devices to simulate every step of the manufacturing process of a nano-enabled product.

NSF DIGI-MAT
The NSF Data and Informatics Graduate Intern-Traineeship: Materials at the Atomic Scale provides Illinois graduate students with the infrastructure available to pursue interdisciplinary training and obtain career-aligned skills through a PhD-level certificate program combining materials and data science.

NSF PIRE
The Partnerships in International Research and Education combines Illinois' world-class experimental resources, computational facilities, and expertise to solve the energy storage grand challenge. It is centered at Illinois and Kyushu University in Japan.

POETS
The Center for Power Optimization of Electro-Thermal Systems was funded with an $18.5M NSF grant and addresses the thermal and electrical challenges surrounding mobile electronics and vehicle design as a single system.

WIT NEW IN 2020
The Center for Wearable Intelligent Technologies is focused on next-generation wearable devices that not only track but adapt their function to assist the wearer autonomously.

XPACC
The Center for Exascale Simulation of Plasma-Coupled Combustion utilizes physical modeling, large-scale simulation prediction, and computational science to develop new modes of advancing combustion using plasma technology.

Research centers in MechSE

MechSE faculty lead or co-lead numerous research centers around the engineering campus, some of which have started up recently and some that are firmly established. Most of them are highly collaborative and involve researchers from other departments, colleges, and/or institutions.

Funded by various sources and ranging widely in size, scope, and structure, the centers generally reflect the constant process that exists for evaluating priorities and deciding on the most vital future directions for research, according to **Harley Johnson**, a MechSE professor and the Associate Dean for Research for The Grainger College of Engineering.

"Many times the awarding of a research center reflects identifying faculty and researchers who are putting together strong teams and rewarding faculty researchers who have really innovative ideas," Johnson said. "It's a process of pulling out these really exciting, innovative things and nurturing them and pushing them forward. It's an important part of the culture of the institution."

Transforming the Lu MEB

Lu MEB shaping up

The exterior of the Sidney Lu Mechanical Engineering Building is starting to closely resemble how the completed project will look.

The next steps include completing the modernized classrooms, laboratories, and social spaces. The project is on schedule to open for classes in Fall 2021.

Pursuit of WELL looks even wiser in age of coronavirus and the new focus on air quality

In a decision that now looks extremely forward thinking, MechSE's **Damon McFall** lobbied successfully to have the department's largest-ever project pursue WELL certification.

WELL is the leading tool for advancing health and well-being in building globally. When completed, the Sidney Lu Mechanical Engineering Building will be the first building on campus to be WELL-certified. Other projects will likely follow suit, given society's new awareness of the air-borne illnesses and respiratory health during the COVID-19 era.

"I concluded that energy efficiency and human well-being needed to complement one another for a mutually holistic greater good," McFall said in an interview with fnPrime, a facilities industry publication in Chicago.

Beyond COVID-19, a higher-quality living and breathing environment inside facilities is a key to overall health, happiness, and well-being. McFall says he hopes Lu MEB occupants "are inspired to embrace the facility as a living laboratory and be encouraged to learn, to explore, and to educate the world."

One aspect of WELL is bringing nature indoors. MechSE is planning for a living wall in its new student center in the trasnformed Lu MEB.

Coffee status: Lu MEB student center is Starbucks-official!

The student center in the new Lu MEB addition will be home to Starbucks Coffee, making it the first academic building on campus to have one! No matter where they come from, students, faculty, staff, and guests from around the world will likely find a snack or beverage that makes them feel right at home.

Keeping up with MechSE alumni's accomplishments and adventures

Sangsomwong boosts Boeing career with M.Eng.ME degree

Troutner named to Forbes "30 Under 30" list

O'Donnell donates paintings to Beckman

Jackson selected to lead Discovery Partners Institute

Boyke globetrots from Urbana to New Zealand

Nobre blazing a path as Amazon manager of emerging countries

Weisensee making big strides early in career

Dr. **Patricia Weisensee** earned her PhD in mechanical engineering from Illinois in December of 2016 and just one month later she had joined Washington University in St. Louis as an assistant professor.

More alumni news

Distinguished Alumni in memoriam

Stanley Weiss (PhDTAM '49)
George J. Trezek (MSME '62, PhDME '65)

Faculty Updates

Andrew Alleyne was elected to the 2019 class of AAAS Fellows.

Narayana Aluru won ASME Applied Mechanics Division's 2020 Ted Belytschko Award for "outstanding contributions to nanomechanics by developing advanced computational techniques and multiscale approaches, revealing novel mechanics at small scales, and providing leadership to the computational mechanics community." He was also named a Fellow of the International Association of Computational Mechanics (IACM) for his distinguished record of research and accomplishment.

Gaurav Bahl has been named a Kritzer Faculty Scholar. He will lead new photonic materials research funded by the Multidisciplinary University Research Initiative (MURI) from the Department of Defense.

Joseph Bentsman will lead a $1M NSF/NIH Cyber-Physical Systems project focused on autonomous robotic electrosurgery. The team includes MechSE professors **Martin Ostoja-Starzewski** and **Leonardo P. Chamorro**, among others.

Alison Dunn won the 2019 Burt L. Newkirk Award for her contributions as a young scientist to the field of tribology. She was also named an Outstanding Advisor in The Grainger College of Engineering.

Elif Ertekin has been named an Andersen Faculty Scholar.She also won a 2020 Grainger College of Engineering Dean's Award for Excellence in Research.

Randy Ewoldt has been named a Kritzer Faculty Scholar. He won the 2020 MechSE Alumni Two-Year Effective Teaching Award.

Jie Feng won funding from the Campus Research Board for his work on drug delivery optimization with nanoparticles.

Bruce Flachsbart won the 2020 MechSE Alumni Five-Year Effective Teaching Award.

Jonathan Freund has been named the new Head of the Department of Aerospace Engineering at Illinois.

Naira Hovakimyan's co-authored article, "Modeling yield response to crop management using convolutional neural networks," was the top download from Computers and Electronics in Agriculture.

Elizabeth Hsiao-Wecksler was awarded funding through the Jump ARCHES program for her project "Autonomous Morphing Bed Mattress for ALS Patients with Limited Movement Ability."

Harley Johnson was selected as an SES Fellow.

William King was named an Outstanding Advisor in The Grainger College of Engineering.

Seid Koric presented a lecture at the International Conference on Plasticity, Damage, and Fracture 2020.

Chia-Fon Lee was named an Outstanding Advisor in The Grainger College of Engineering.

Tonghun Lee has been named a Kritzer Faculty Scholar.

Moshe Matalon won the 2020 Ya. B. Zeldovich Gold Medal from The Combustion Institute for his lifetime achievements in the field. He also gave the Beacon Seminar Series lecture at the Center for Combustion Energy at Tsinghua University in Beijing.

Katie Matlack was the only winner from Illinois this year of the Air Force Office of Scientific Research's competitive Young Investigator Program award.

Nenad Miljkovic was one of 2020's recipients of the Ronald P. Harrelson Outstanding Young Manufacturing Engineer Award from SME.

SungWoo Nam has been named an Andersen Faculty Scholar. He was also named an Associate of the Center for Advanced Study for his research on single quantum emitters using wrinkled two-dimensional semiconductors.

Taher Saif has been named a 2020 Engineering Science Medalist by the Society of Engineering Science.

Huseyin Sehitoglu presented a lecture at the International Conference on Plasticity, Damage, and Fracture 2020.

Chenhui Shao was awarded a prestigious NSF Faculty Early Career Development (CAREER) grant to work on smart ultrasonic metal welding.

Kelly Stephani has been named a Kritzer Faculty Fellow.

Sameh Tawfick won the 2020 MechSE Alumni Two-Year Effective Teaching Award.

Charles Tucker III was named the first-ever Fellow from the Americas of the Polymer Processing Society.

Alexander Vakakis has been named the winner of a 2020 Humboldt Foundation Research Award.

Arend van der Zande, for the second year in a row, made Clarivate's list of Highly Cited Researchers, a global list of the world's researchers who produced the most influential papers.

Amy Wagoner Johnson has been named an Andersen Faculty Scholar. She will lead the new Department of Biomedical and Translational Sciences in the Carle Illinois College of Medicine. She was also named an Outstanding Advisor in The Grainger College of Engineering.

Aimy Wissa (center) hosted representatives from Toyota to showcase her avian-inspired anti-stall devices on UAVs and how they could be applied to the company's Mothership project.