MECHANICAL SCIENCE AND ENGINEERING / SPRING 2016

MechSE

Leading the Way

MechSE has emerged as a top program for women in engineering

MechSE receives significant new NSF funding

NSF, Killeen on hand to launch POETS in style

The new $18.5 million NSF research center headed by MechSE professor **Andrew Alleyne** was formally launched on October 15, 2015.

The Center for Power Optimization of Electro-Thermal Systems, or POETS, held its kickoff meeting on the Urbana campus. The grand opening celebration featured speakers such as University of Illinois President **Timothy Killeen** and National Science Foundation Director **France Cordova**.

"This new engineering research center is what we at NSF like to call a really big deal," said Killeen, a former NSF assistant director. "These are very difficult grants to get. Incredibly competitive. Best ideas across the country competing. To win an engineering research center is something that we're immensely proud of."

NSF Assistant Director of Engineering **Pramod Khargonekar** commended Alleyne and his team for their outstanding proposal. One of only three centers awarded out of 198 applicants, POETS stood out for its scientific and technological opportunity, the team of universities and industry partners involved, its commitment to education, and the strong ecosystem it will create, structuring a straight path from the lab to real-world application.

"We want to increase the total power density in vehicles by 10 to 100 times," said Alleyne, the Ralph & Catherine Fisher Professor in MechSE. "Today's electrical technologies are at their thermal limit."

Ground-breaking energy project moves forward

A renewable energy project led by MechSE researchers is one of 17 proposals being funded by the National Science Foundation in its latest round of innovative, international research projects to advance the frontiers of science and engineering and forge robust collaborations with scientific expertise around the world.

Narayana Aluru, Richard W. Kritzer Distinguished Professor in MechSE and director of the Computational Science and Engineering Program at Illinois, is the principal investigator on the project, "Integrated computational materials engineering for active materials and interfaces in chemical fuel production."

"This award combines our world-class experimental resources, computational facilities, and expertise to solve the energy storage grand challenge," Aluru said. "The team will focus on solid oxide electrolysis cells that transform renewable energy into chemical energy and store it for later use. These cells are viewed as a clean, efficient path to a carbon-neutral economy. Our goal is to make this technology more efficient and reliable."

The program is a centered at the University of Illinois and Kyushu University in Japan. Collaborating institutions include Northwestern University and the University of California, Berkeley.

"In addition to the research effort, there is a substantial education and outreach program through which undergraduate students can participate in summer research exchange programs between our U.S. institutions and Kyushu University," said **Petros Sofronis**, a MechSE professor and director of the International Institute for Carbon-Neutral Energy Research (I^2CNER).

"The combination of the University of Illinois' and NCSA's expertise in state-of-the-art computational sciences with the experimental leadership of Kyushu University in solid state ionics uniquely positions our team to make some impactful advances to solve this challenging problem," said MechSE assistant professor **Elif Ertekin**.

From the Department Head

I write this letter with one full semester under my belt as MechSE's department head. Even though I have been here since 1992, I did not truly grasp the greatness of this department until these past few months. What our students and faculty accomplish on a daily basis is truly inspiring, and we are proud to convey some highlights of these achievements in this magazine.

Professor **Elizabeth Hsiao-Wecksler** and Gutgsell Professor **Taher Saif** have joined MechSE's administration as associate heads of undergraduate programs and graduate programs, respectively. They are each accomplished educators and run renowned research programs, and the leadership they have brought to these vital administrative positions has already been felt by the department and our students.

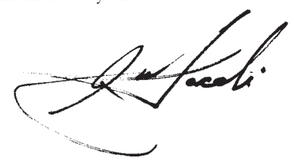
We have also experienced the positive influence of the National Science Foundation (NSF) in recent months. The federal agency's leadership team was on campus to help Fisher Professor **Andrew Alleyne** launch the new POETS Center. NSF also announced funding toward an impressive new renewable-energy initiative headed by Kritzer Professor **Narayana Aluru**. Furthermore, for the first time ever in one year, the National Science Foundation has awarded its CAREER honor to four early-career MechSE faculty members: Assistant Professors **Elif Ertekin**, **Yuhang Hu**, **Nenad Miljkovic**, and **SungWoo Nam**. This unprecedented news signals continuing excellence for MechSE's faculty.

I believe you will enjoy reading our extended section on MechSE's women students, alumni, and faculty. It is no secret that engineering degrees were earned disproportionately by men for many decades, but MechSE is a fantastic place to see the turning tide of women's engineering accomplishments. Thanks in large part to the work of women in MechSE, our impact on the world has never been greater. When you turn to page 6, you will begin to see what I mean!

If you read our Fall 2015 magazine, you will recall our announcement of the "Transform MEB" campaign we are undertaking. This project will create the most substantial overall improvement to facilities the department has seen since the Mechanical Engineering Building opened for classes in 1950—even beyond the Mechanical Engineering Laboratory addition made 15 years ago. On pages 34 and 35, you can find out more about the Transform MEB project and see how it is progressing.

We are enjoying a great 2016 in MechSE, and I wish you an equally productive and memorable year!

Best regards,



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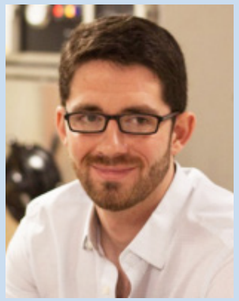
MechSE In the News

White noise machine

Eli Lazar (MSME ’08, PhDME ’11) has launched a new start-up company, SNOOZ, which develops energy-efficient white noise machines that use a proprietary fan in an acoustically optimized enclosure. The company’s Kickstarter campaign to produce the machines surpassed its financial goal by nearly $100,000. Designed with airflow simulations run on supercomputers, SNOOZ generates live, natural white noise—without looping soundtracks or low-quality speakers—that is adjustable and doesn’t disturb the surrounding air. It has been featured online in Crain’s, Chicago Inno, Gizmag, Cult of Mac, and Digital Trends.

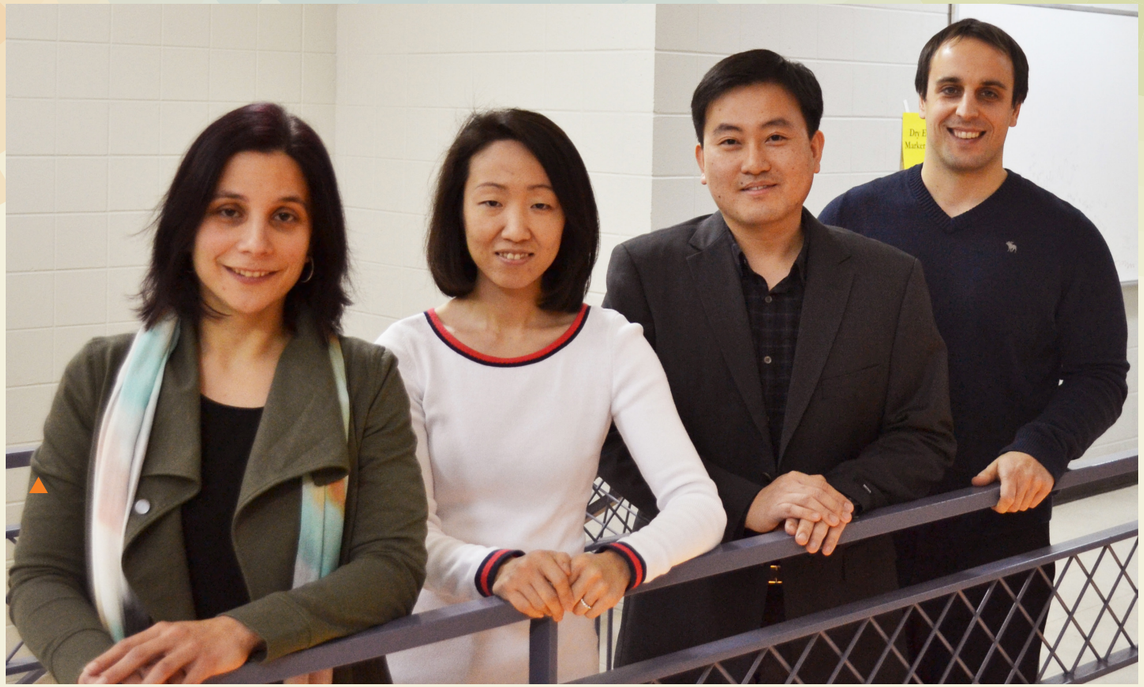
Forbes 30 Under 30

MechSE alumnus **Scott Daigle** (BSME ’09, MSME ’11) and current senior **Patrick Slade** have each been named to Forbes Magazine’s 2016 “30 Under 30” list, which identifies the “brightest young entrepreneurs, breakout talents and change agents in 20 different sectors.” Daigle, co-founder and CEO of Intelliwheels, Inc., landed on the magazine’s Manufacturing & Industry list for his work in making wheelchairs easier and less taxing for users to push and maneuver. Slade, a co-founder of PSYONIC, has made breakthroughs with his prosthetic hand technology and was on the magazine’s Healthcare list.



Scott Daigle

Patrick Slade



NSF CAREER Awards

Four MechSE assistant professors have received National Science Foundation CAREER Awards for 2016. This marks the first time the department has had four faculty members receive this competitive award in the same year. It is the NSF’s most prestigious award in support of junior faculty, and the CAREER Award winners exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations. From left to right, these faculty members are **Elif Ertekin**, **Yuhang Hu**, **SungWoo Nam**, and **Nenad Miljkovic**.

Professor's drones make the Times

MechSE’s newly named Wilkins Professor, **Naira Hovakimyan**, her $1.5M National Science Foundation grant, and her assistive robots all made the *New York Times* in December 2015. These robots, which are small autonomous drones, may play a major role as the world’s population ages. The ranks of older and frail adults are growing rapidly in the developed world, and Hovakimyan envisions drones becoming an everyday fixture in elder care, carrying out simple household chores. “I’m convinced that within 20 years, drones will be today’s cellphones,” she said.

Hall of Famer

Robert Kern (BSME ’47) has been inducted into the College of Engineering Hall of Fame, which recognizes Illinois engineering alumni and affiliates who have significant achievements in leadership, entrepreneurship, and innovation of great impact to society. Kern has been recognized for his entrepreneurial perseverance in building Generac into a leader in lightweight portable generators and for his philanthropic spirit in helping shape the next generation of engineers. Kern said, “My vision was incredibly small compared to what the company became, but tenacity is what it is all about.”

Robots for everyone

Nick Kohut (BSME ’07) is the CEO and co-founder of Dash Robotics, which recently raised over $60,000 on Kickstarter, the company’s second successful crowdfunding campaign. He and his team are launching their first product, a nature-inspired crawling toy robot called the Kamigami robot. It has been featured on Wired and Tech Crunch. The company started as a research project before Kohut realized these robots would make a great educational tool and a fun hobbyist kit, and that their construction process make Dash much more affordable than other DIY robots.

Leading the Way

The MechSE department is full of women who are absolute ***rock stars*** in mechanical engineering and engineering mechanics.

For many decades, our department has made an impact on the world through fundamental contributions to mechanical engineering. And MechSE today may have more talent than ever before in our rich history of excellence. The stage right now is filled with shining stars—many of them women.

More and more talented women are fueling the field of engineering with a wide array of research and innovations that impact society every day. In MechSE, some of them are even bringing us into the national and international spotlight.

The following highlights of our women faculty, students, and alumni represent just a small fraction of their extraordinary achievements.

In the last six years, our department has seen a remarkable 50 percent increase in the number of enrolled women **undergraduate students**, and we are now ahead of the national curve for mechanical engineering departments. MechSE's undergraduates in mechanical engineering and engineering mechanics are an impressive group, and the young women among them play a vital role in making the department a top ten program. Through academic excellence, leadership in student organizations, unique internships, creative outreach, and much more, they continually achieve greatness.

Enrollment of women **graduate students** in our programs has increased by an impressive 30 percent since 2010. They consistently achieve top honors for their work, and many of them boast research funded by fellowships and assistantships. They contribute to faculty research programs in vital ways, go on to careers as leaders in academia, industry, education, and government—and they lead inspiring lives outside the lab, too!

Nine new women **faculty** have joined MechSE in the last five years, and their inspiring talent has helped solidify the department as a home for greatness. Mechanical science and engineering offers so many opportunities for life-changing innovations in health and biology, energy, the environment, national defense, manufacturing, and transportation. Our women faculty are well-represented across all of these areas and many more.

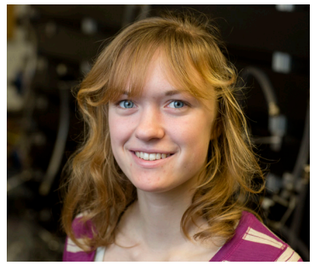
Procurement of nuclear fuel. Disney World ride design. Teaching the next generation of Navy and Marine Corps officers. Software design for semi-autonomous vehicles. To be a MechSE **alumna** means having a career that's way beyond the "expected," whether they are ascending the ranks in industry, contributing to future generations with a career in academia, or blazing a new trail through entrepreneurship.

We extend a special note of thanks to The Beatles, whose iconic Abbey Road album cover inspired this photo of "rock star" graduate students (from left) Ashley Armstrong, Dolaana Khovalyg, Ritu Raman, and Samantha Knoll.

Women of MechSE

A LOOK AT A FEW UNDERGRADUATES

> "I think my varied passions – flying planes, creative writing, music, and many others – represent the diverse interests of MechSE's undergrads."



Taylor Tucker, junior in engineering mechanics and a MechSE blogger, spent last summer assisting an aircraft mechanic in a full-service hangar at Blodgett Memorial Airport in Houghton Lake, Michigan. Her work involved helping with annual inspections – cleaning or replacing spark plugs, changing oil, and checking the condition of the engine mount, gaskets, and seals. Tucker is also conducting research on particle collisions in a Mars atmosphere, and she is ambitiously working toward her private pilot's license.

> "Undergraduate women need to take on leadership positions, because a stronger community for women in engineering creates a better community for everyone."

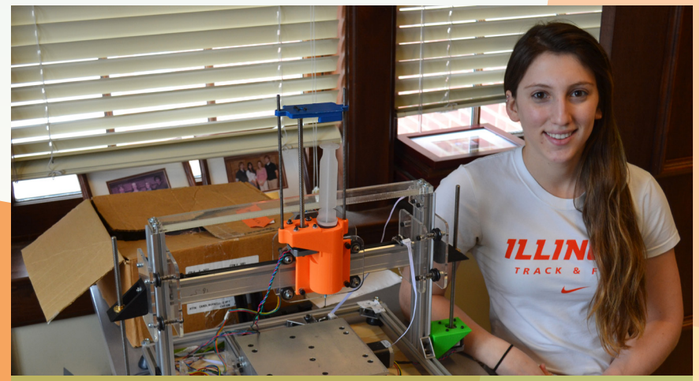
Last year, a new organization launched to support the growing number of women undergraduate students. **Women in MechSE** was created for and by MechSE women to share experiences and learn about career opportunities. The group originally began as a committee under ASME, co-directed by undergrads **Kea Evans** and **Sandra Gonzalez**. They believed that leadership among women in MechSE had decreased, so they wanted to create a group to encourage it. Through career fairs, leadership events, company visits, lunches with women faculty, and weekly meetings, the group provides opportunities to explore career paths and encourages women to join other MechSE registered student organizations that have been predominantly male in the past.

> "Being part of a community of bright and talented students pushes me to continue to be the best that I can be."

The resume of junior **Oluwami Dosunmu-Ogunbi** reads like an accomplished career woman. She has conducted research on powder-based 3D food printing at the National University of Singapore. As a student in the Hoeft Technology and Management Program, she participated in an international business competition in Brazil over winter break. She interned at the Toyota Motor Manufacturing plant, taking on two major projects and seven others to improve the testing process of quality checks. She is a Chancellor's Scholar, and helps influence engineering education—serving as a Student Consultant on Teaching (SCOT); a Resident Project Advisor and mentor to 50 incoming engineering students; and a Lead ELA (Engineering Learning Assistant) for freshmen. Her research experience in the lab of a pioneering virtual reality scientist at Illinois confirmed her interest in pursuing a graduate degree.

"As one of the largest and best Colleges of Engineering in the world, we have a duty to increase the diversity of engineering and science. The future success of our college and of the solutions that our engineers build both depend on creating vibrant teams of individuals from different personal, cultural, and disciplinary perspectives."

— Andreas Cangellaris,
Dean of the College of Engineering



> "Biotechnology has the potential to change how we live in incredible ways. Assistive technology for diseases like arthritis and Parkinson's is improving, but is often bulky and hard to use. I want to help improve the functionality and cost of assistive and prosthetic devices."

When engineering mechanics junior **Liz Livingston** isn't competing as a pole vaulter for the Illinois Track and Field team or assisting with research in the Tissue Biomechanics Lab, she's leading the Society for Experimental Mechanics. As president of SEM, she has helped the club double in size through increased awareness and worked with department staff to improve the EM curriculum. In the fall, she'll join a select few as an Engineering Learning Assistant for a freshmen orientation class. And although her current commitments keep her too busy to actively volunteer, Livingston helped run a non-profit organization for eight years in Dallas, Texas, repairing and distributing bicycles throughout the city. After graduation, she hopes to work in the biotechnology arena or pursue a graduate degree in biomechatronics.

> "It's important to me to support equal opportunities for minorities in engineering."

Senior in mechanical engineering **Brittany Miriki** has held several executive roles in the university's chapter of the National Society of Black Engineers (NSBE). From this experience, she recognized a need to unify black women in STEM—and last summer co-founded Sistas in STEM, a new organization aimed at creating a support system. Thanks to networking for her public relations position in NSBE, Miriki gained an interest in technical sales, and after graduation she will be employed in the Sales Development Program for Ingersoll Rand in the industrial supplier's Chicago office.

#GirlsAreEngineersToo

The tech and engineering industries have long seen a lack of diversity among the people who run and work in those companies. Underrepresented minorities, including women, historically have not been encouraged to enter STEM fields. But that's starting to change, thanks in part to the influence of social media.

In August, a young engineer, Isis Anchalee, was featured in a recruiting ad for her San Francisco-area tech company. What resulted was a backlash against Anchalee and her employer for featuring a woman who didn't fit the common perceptions of women engineers. She immediately launched a hashtag on Twitter to challenge these misperceptions. "This industry's culture fosters an unconscious lack of sensitivity towards those who do not fit a certain mold," said Anchalee. **#ILookLikeAnEngineer** went viral, with women engineers around the world sharing their stories to promote awareness.

"**Amy Poehler's Smart Girls**," a website and organization co-founded by the actress and directed at young women, uses humor, blogs, videos, and games to emphasize intelligence and imagination over "fitting in."

A LOOK AT A FEW GRADUATE STUDENTS

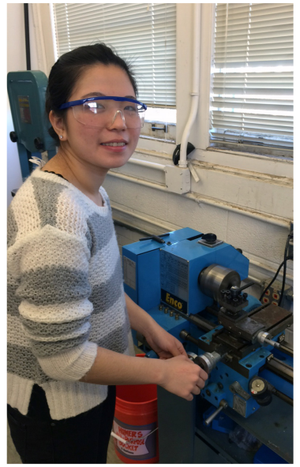
"I hope to create viable graft alternatives that could eliminate painful and expensive bone harvest surgery. With 1.5 million graft procedures in the U.S. each year, my research has significant clinical relevance."

While an undergraduate at Notre Dame, **Ashley Armstrong** was a three-time Academic All-American on the women's golf team. Now a master's student in MechSE, with NSF, NCAA, and ACC fellowships and the help of co-advisors in the fields of controls and biomechanical engineering, she is again on a path to greatness. Armstrong is fabricating a high-precision additive manufacturing (AM) machine that will be used to print advanced architecture synthetic bone scaffolds (implanted artificial structures that direct bone growth and formation). Bone has a remarkable potential for self-repair, but large skeletal defects don't heal properly and need assistance. Diseases (like arthritis), tumors, and trauma can lead to bone defects, and once perfected, bone scaffolds could address this problem.

"My work can be applied beyond the scope of AC&R – in the design of compact and reliable micro-heat exchangers for cooling high-power density miniature electronic devices used for power electronics, lasers, avionics, and far-space exploration."

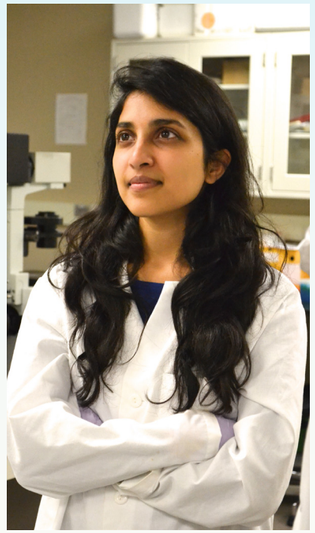
The heating, ventilation, air-conditioning, and refrigeration (HVAC&R) industry plays a predominant role in achieving sustainability around the world—and it faces big challenges. For example, thermal systems with low charged synthetic refrigerant have low global warming potential, so a more energy-efficient solution for these systems is more vital than ever before. **Dolaana Khovalyg**'s doctoral work focuses on the fundamental study of two-phase flow boiling in compact microchannel heat exchangers. The microchannel technology is a ground-breaking technical solution that allows for significant reduction of the heat exchangers' volume, weight, and raw material. Khovalyg aims to develop a comprehensive operational map delineating stable and unstable operating conditions of microchannel evaporators used in AC&R. In January, Khovalyg was one of only eight finalists to compete in the Singapore Challenge 2016, part of the Global Young Scientists Summit.

"The simulators will revolutionize the way clinical training is done by helping to standardize diagnostic procedures across hospitals, varying methods of teaching, and different economic and technological conditions."



With a bachelor's degree in mechanical engineering from MIT under her belt, **Jiahui (Carrie) Liang** is working on a simulator device to replicate abnormal muscle tone behaviors at the elbow joint. Under the guidance of co-advisors in MechSE, the project is funded through a partnership between Illinois and the Jump Trading Simulation & Education Center at OSF Saint Francis Medical Center in Peoria. When complete, the simulator will be used as a training device to allow young medical students to experience different muscle disorders without the presence of patients. Existing simulator designs typically involve the use of high-end electromechanical devices and focus heavily on control algorithm development. Liang and team's simulator is capable of generating a wide range of resistive feedback without the need for a computational scheme.

"Bio-bots will improve the future of healthcare and medicine. Designing with cells to make machines that are living means improvements in, for example, drug delivery, surgical robotics, 'smart' implants, and toxin detection and neutralization."



PhD candidate and NSF Graduate Research Fellow **Ritu Raman** (MSME '13) has helped develop, with ME and bioengineering researchers, a new class of walking "bio-bots" powered by a strip of skeletal muscle cells that can be triggered by an electric pulse. Inspired by the muscle-tendon-bone complex, the bio-bots have a backbone of 3D printed hydrogels and living cells—strong enough to give it structure but flexible enough to bend like a joint. These bio-integrated machines can self-organize, self-heal, and self-replicate in response to a complex array of environmental cues. Raman was co-first author of a 2014 PNAS publication introducing this current generation of bio-bots, and in 2015 she won the coveted Illinois Innovation Prize, a campus-wide competition for student entrepreneurs.

"Our technology creates a continuous data link between farm owners, operators, and the land, allowing operators to be in 'many places at once,' resulting in optimized work flow, enhanced yields, and increased profit."

Supported by a Linda Su-Nan Chang Sah Doctoral Fellowship, PhD candidate **Samantha Knoll** (BSEM '11, MSTAM '13) works in the fields of cellular biomechanics and bio-nanotechnology—studying the ways in which florescent excitation light affects cell force dynamics. She is also a successful entrepreneur, co-founding AViculture (aerial vehicles in agriculture) in 2014. Their custom-designed autonomous aerial vehicles coupled with unique image processing techniques provide a new perspective in increasing efficiency in farm operations. Knoll and the AViculture team were finalists in the high-profile Cozad New Venture Competition in 2014 and semi-finalists in 2015. As an alumna of Illinois' Hoeft Technology and Management Program, she also served as a team mentor at the program's 2016 International Business Plan Competition in Brazil.

"My work will help optimize the electric and thermal management of electronic systems in devices with enhanced cooling techniques, which has many applications in aviation, energy, and agriculture."

Doctoral student **Patricia Weisensee** studies the interaction of liquid droplets with superhydrophobic surfaces—non-wetting surfaces from which water droplets roll off easily—and how the design of this type of surface can enhance heat transfer. Using a high-speed camera to record the impact of droplets hitting these nano-engineered surfaces, she has shown up to two times smaller contact times when compared to rigid surfaces. Weisensee's career goal is to become a professor, and she has taught or co-taught several courses with her advisors. She also sings in two university choirs. "I believe the more balanced a student's life is, the better his or her performance will be in every aspect, including more productive research and teaching."

"I want to get more girls interested in science and exposed to engineering at an early age."

Before MS student **Lydia Bakalova** became passionate about the field of biomechanics, as a child she was fascinated with math, science, and logic. In addition to her formal research, she is studying children's brain development and working with toddlers to design educational toys that stimulate concepts of logic from an early age. "I am researching the connection between physiological development and toys that are appropriate for the specific age. For example, at an early age babies are still developing eyesight and have limited understanding about colors and shapes. Therefore, from my current understanding, they cannot distinguish non-contrasting colors, so pink toys for baby girls may not be very useful. As their physical skills develop, toys should also follow that trend and foster healthy learning before babies can even talk or walk."

FACULTY

Alison Dunn, *assistant professor*

In her Materials Tribology Laboratory, Dunn's research centers on what she calls "non-traditional tribology," and she is most interested in natural tribological systems—specifically, any part of the body that has a sliding interface, like knees, hips, and eyes, and therefore has the potential for disease associated with damage. Reducing friction, particularly of an implanted material, could extend the life of implants and cause less damage or rejection.

Naira Hovakimyan, *W. Grafton and Lillian B. Wilkins Professor, University Scholar, Schaller Faculty Scholar*

A leading expert in the field of robust adaptive control systems, Hovakimyan developed the L1 adaptive control system, the only one tested on manned aircraft and able to override a variety of in-flight failure configurations. In September, she'll test it for the first time on a manned F-16. Additionally, her team is designing "friendly drones" to assist with daily household tasks and interact on a more personal level, as well as robots for the elderly, allowing this growing population to live independently for longer and improve their quality of life.

Yuhang Hu, *assistant professor*

Hu studies pitcher plants and other bio-inspired systems and soft materials to develop robust mechanical-material testing techniques and create new materials and devices with multifunctionalities. The varying surface property of material systems found in nature informed Hu's development of a new material system that can be adjusted using mechanical stimuli. The resulting ability to tailor the morphology of cells and tissues could impact the fields of biology and bioengineering.

Shelby Hutchens, *assistant professor*

With a background in chemical engineering, Hutchens characterizes soft materials – primarily polymers – at small scales and studies soft materials fracture. She is developing a new class of materials, and by tuning their material properties and geometry, she hopes to use them as implantable "soft casts" to help heal soft tissue that's been traumatized, leading to better recovery of the tissue's original function.

Elif Ertekin, *assistant professor*

Ertekin incorporates a mixed background in the mechanics of materials and materials physics, using atomistic computational methods to design and understand new materials and structures to address a wide range of globally relevant issues, such as energy sustainability, next-generation electronics, and environmental remediation. She also invests hugely in her teaching, and is part of a core group of faculty who are transforming the department's TAM 200-level courses.

Elizabeth Hsiao-Wecksler, *professor, Willett Scholar, Associate Head of Undergraduate Programs*

Methods from control theory, movement analysis, design, and dynamic systems modeling form the basis of Hsiao-Wecksler's Human Dynamics and Controls Lab program to investigate issues related to musculoskeletal biomechanics and rehabilitation engineering. She seeks to improve quality of life by improving mobility—focusing on movement control and function through locomotion biomechanics and assistive device development.

Iwona Jasiuk, *professor*

As co-director of the Center for Novel High Voltage/Temperature Materials and Structures (HV/TMS), Jasiuk conducts precompetitive research in materials and methods that can improve the efficiency of our country's system of electrical power lines. The impact could include huge energy savings, potential prevention of power outages due to ice and wind, and novel solutions for the next-generation electrical grid.

Mariana Kersh, *assistant professor*

Using clinical-level medical images and finite element analysis in her Tissue Biomechanics Lab, Kersh examines the structural and mechanical properties of musculoskeletal tissues to better discern and develop treatments for bone and joint diseases. With a new grant to study the long-term effects of subchondroplasty procedures on bone and cartilage strength, she hopes to understand where the problems of osteoarthritis begin and to present treatments for subchondral bone defects.

Glennys Mensing, *adjunct assistant professor, MNMS laboratory coordinator*

With a master's degree in chemistry from Clemson and a PhD in physics from Vanderbilt, Mensing's work focuses on design, fabrication, and characterization of micro-electromechanical (MEMS) devices in silicon. As MNMS lab (cleanroom) coordinator, she assists other scientists with this process as well.

Amy LaViers, *assistant professor*

LaViers directs the Robotics, Automation, and Dance (RAD) Lab, where she builds a strong connection to dance theory using concepts from Laban/Bartenieff Movement Studies. Her current focus is using LBMS to develop a robotic control system that offers a variety of movements—benefiting operators such as rescue workers commanding humanoids for disaster relief efforts; soldiers using drones to investigate a suspected danger; or a bomb squad dismantling an explosive device with a mobile manipulator arm. Her research also has applications in advanced manufacturing, collaborative robots, and robotic prosthetics.

Mariana Silva, *curriculum development coordinator, academic advisor, adjunct assistant professor*

With a PhD in TAM from MechSE, Silva serves the department's undergraduate students through course planning, study abroad facilitation, and course enrollment for new students. She helped implement state-of-the-art pedagogical and technological solutions for the department's foundational TAM 251 and TAM 210/211 courses, and was instrumental in setting up MEB's only flexible learning classroom for more integrated, active learning.

Kelly Stephani, *assistant professor*

Stephani's research interests have a foundation in the modeling of fundamental processes involved in gas-surface and plasma-surface interactions. Working with experts in plasma processing and plasma-material interactions, she conducts computational simulations of non-equilibrium flows and studies of gas-surface and plasma-surface interactions. A recent award from NASA funds her work on state-of-the-art simulation capabilities for high-velocity atmospheric vehicles under unique conditions.

Amy Wagoner Johnson, *associate professor*

To address complications in the repair of diseased or traumatized bone, Wagoner Johnson designs synthetic bone substitute materials and scaffold systems that may one day replace bone grafts currently harvested from patients or donors. Working with local surgeons, her team studies the scaffolds' macro- and micro-structure, characterizing their biological response.

Xiaofei Wang, *research assistant professor*

Wang's primary interests are the experimental aspect of energy conservation in air conditioners and refrigeration systems—aiming for sustainability and new, renewable energy. She explores the flow regimes of two-phase flow in air conditioning and refrigeration systems, which affect heat transfer. Her goal is to reduce energy consumption from these systems in residential and commercial systems.

Aimy Wissa, *assistant professor*

Inspired by the agility, adaptability, and efficiency of birds' wings, Wissa designs and builds adaptive structures that change their shape in response to external stimulants. In her Bio-inspired Adaptive Morphology (BAM) Lab, her current research aims to revolutionize unmanned aerial vehicle design and has both military and civilian applications – including surveillance for combat intelligence and inspection of crops.

Women of MechSE

A LOOK AT A FEW ALUMNI

"In my work I aim to improve the daily comfort of machine operators and prolong the life of Caterpillar's machines so they can work longer between maintenance stops."

Gail Butler (BSME '15), the sole female team captain in SAE Baja's recent history, credits her role on the team as a major influence in shaping her career path and enabling her to put into practice all of the concepts she learned in the classroom. After a student practicum at Caterpillar, Butler has been employed since August at the company's Peoria, Illinois, facility as a test engineer in the motorgrade transmission development group, assisting with both lab and on-machine testing. Part of her job is to tune shifts to minimize wear in the transmission while also reducing the jerking motion the operator feels during gear changes.

"The 11 reactors we operate in Illinois generate 48 percent of the state's electric power supply and 90 percent of its carbon-free power, which prevents the release of nearly 80 million metric tons of carbon dioxide annually—the equivalent of taking more than 15 million cars off the road."

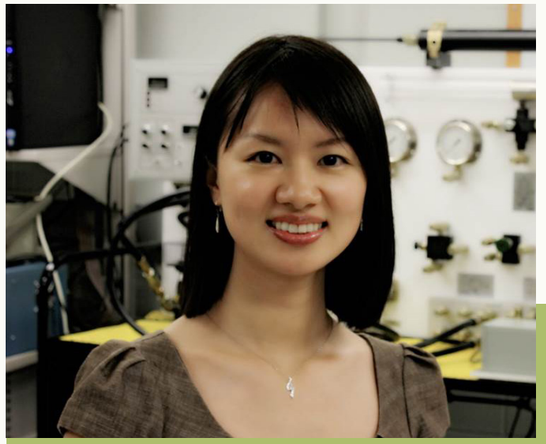
As Director of Nuclear Fuel Supply for Exelon Generation, which operates the largest nuclear fleet in the country, **Jeanne Shobert** (BSME '85) procures nuclear fuel for the reactors that Exelon owns and operates in Illinois, Maryland, New York, New Jersey, and Pennsylvania. Managing a team of five, she is responsible for purchasing uranium ore, along with various ore-processing services, from sites around the world. "In the final step of the process, uranium is made into ceramic fuel pellets, which are loaded in fuel assemblies that go in the reactor core. My team works closely with the reactor core design group and the fuel vendor to ensure safe, efficient operation of the fuel once it's in the reactor," said Shobert, who also earned an MBA from the University of Chicago in 1991.

"I help improve the functionality and reliability of the rides at Walt Disney World."

Growing up in Miami, Walt Disney World was **Natalie Reyes'** (BSME '13) favorite place to visit as a child. It is the happiest place on Earth, after all. She also discovered an interest in mechanical engineering early on—and found the perfect way to combine these two passions. Thanks in part to several engineering internships at Disney World during her undergraduate career, Reyes is now employed as a Ride Mechanical Engineer with the Design and Engineering team, where she works on a variety of machine design and analysis projects.

"I'm hoping to impact the future leaders of America and help motivate and mentor the next generation of Navy and Marine Corps officers."

Captain **Serena Tyson** (MSME '08) graduated from the United States Naval Academy, earning a place in the top 10 percent of her class and a distinction as the top female graduate in the Weapons and Systems Engineering Department. As a master's student in MechSE, she conducted research and co-authored papers on a pneumatically operated ankle-foot orthosis—a small orthotic device that uses fluid power to return flexibility of motion to people who have lost muscle control over their lower leg. She then trained at Vance Air Force Base, earning her Naval Aviator Wings in 2010. Subsequent assignments saw her on helicopter squadrons; deployed to Afghanistan to fly combat missions; as an Attack Helicopter Commander and Functional Check Pilot; and currently as an Equal Opportunity Officer and Quality Assurance Officer for her Marine Light Attack Helicopter Squadron 169, and as instructor in the Naval Academy's Aerospace Engineering department.



"I'm developing new attributes to Ford's existing semi-autonomous vehicles, helping people drive better and safer."

"The impact of our work is far-reaching: 45 out of the top 100 online retail companies use SOASTA to help them optimize customer experience critical to revenue growth, brand, and reputation."

Heidi Larsen (BSME '81), one of the newest members of MechSE's Alumni Board, uses the analytical approaches to complex problem-solving she learned as an ME undergraduate in her career in high technology. In her role as a manager at SOASTA, a software startup in Silicon Valley that provides solutions to optimize the performance of web and mobile applications with real-time, big data analysis and cloud testing, Larsen helps the company integrate its technology with that of its clients. Her interest in enterprise software began when she was a sales engineer at Rockwell Automation assigned to the Silicon Valley territory. "Silicon Valley has great appreciation for Illinois engineering graduates. Employers here know our alumni are 'battle tested' with a sound education that can be applied to all aspects of high technology."

"My career started from my experience in the labs in MechSE. I learned how to appeal the significance of my research work to society."

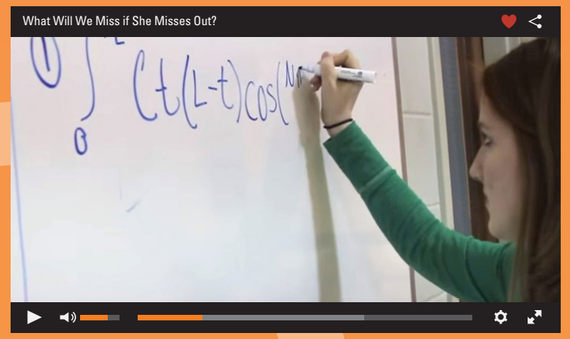
When **Chieko Kondou** was a postdoctoral researcher in MechSE from 2009 to 2011, her research on condensation of various refrigerants initiated significant follow-up work and citations. Now, as an associate professor in the Graduate School of Engineering in the Division of System Science at Nagasaki University in Japan, Kondou is continuing to have an impact on the air conditioning and refrigeration (AC&R) field. She is developing systems that use new environmentally benign refrigerants with low global warming potential. And she is working on an advanced electronics cooling device for supercomputers, power devices, and more. She's also winning awards for her work and publications, from the Japan Society of Refrigeration and Air Conditioning Engineers (JSRAE) and the *International Journal of Refrigeration*, to name just two.

Semi-autonomous vehicles are one of the newest ways auto companies are developing technologies to better assist drivers. As a research engineer at Ford Motor Company, **Nanjun Liu** (MSME '11, PhD ME '14) works on sensors and software for semi-autonomous features that will perform like a co-pilot, acting as an additional set of eyes, ears, hands, and legs.

WHAT WILL WE MISS IF SHE MISSES OUT?

As a MechSE undergrad, **Kimberly Slaughter** (BSME '15) created a powerful video for a class featuring women students in engineering, many of them MechSE students. The message of her video on YouTube, which has been widely circulated, suggests that every young girl should be given the chance to excel in engineering, math, and science. Below is the transcript (slightly edited for space). Watch the video here: mechanical.illinois.edu/blogs/what-will-we-miss-if-she-misses-out.

It happens almost every time someone asks me about my major: surprise on their face. And then there's the usual responses. There's the tried-to-be-nice, backhanded compliment responses. Like, "Oh, but… you're so cute," or "But you're so outgoing." As if a requirement to be in such a career was that you had to be ugly and stare at the floor when you meet new people. And my personal favorite: "No you're not!" But indeed I am. I'm a girl, and I'm an engineer.



If the situation were reversed, and a man was being asked about his major, no one would be surprised. In fact, at a university with over 7,000 engineering majors, people come to expect that answer. Why is that? Why are men expected to be the ones coding, designing bridges and skyscrapers, and innovating the world we live in? Why not women?

Why is it such a shock when you hear that a completely "normal" woman is entering the male-dominated fields of math and science? I don't believe it has to be this way. There's a reason there are more men than women in engineering, and there's a simple way to fix it. It all begins when children are young. Boys are geared toward expanding their problem-solving, spatial-reasoning, and design skills as children, when they are given blocks, Lincoln Logs, Legos, and model trains and cars. On the other hand, girls are given tea party sets, dollhouses, and baby dolls to nurture and take care of. And this is fine too, but for some girls, this just isn't enough.

What about the girl who wants to do more, but she can't because her parents tell her those toys are for boys? What if she never gets to learn and develop interest in math and science? Doesn't she deserve the same opportunities as any boy? If she comes home asking how things work, and you assume it's too complicated and tell her she won't understand, eventually she's going to stop asking.

And what happens when she stops asking? When that curiosity dies out, she's going to miss out on a lot. She's going to miss out on a whole field of knowledge that she could flourish and excel in, a favorite subject in school, or a career that she didn't know was an option for her. But it's not just her that will miss out. What about the rest of the world? What are we going to miss if she misses out?

Think of all that might not happen if we don't encourage girls when they are young: a cure for diseases like Alzheimer's or cancer; a breakthrough in clean energy; a leap forward in our journey to send humans to Mars; new technologies to better predict natural disasters. There is so much going on in the world right now – so many opportunities for life-changing innovations and discoveries. The truth is, if she grows up thinking that science and engineering is only for boys, she will not be the only one impacted. We will miss all of the things that she was told that she couldn't do, and that's just something we can't afford.

But we *can* fix this.

All it takes is for us to realize that girls are more than just pretty faces. Don't put her in a box. Tell her she's smart, she's ambitious, that she is creative, innovative, resourceful, *and* beautiful. Encourage her curiosity. Feed the scientist inside of her. Teach her to ask questions. Explore with her. Let her take apart her toys to see how they work. Let her reach her full potential. Give her that chance, and she will never miss out.

Grad student applies research to ships, cars

MechSE PhD student **Seungho Lee** had an incredible opportunity to see his research in action—and not just in the lab. In September, he traveled to the United States Naval Academy in Annapolis, Maryland, to test his model predictive control solution in naval ships on the Chesapeake Bay.

Lee's research is focused on how to solve a game theory problem applied with min-max model predictive control fast enough so the solution can be implemented in real time. This involves developing the algorithm that computes one's optimal action based on an opponent's expected movements. The goal is to use the algorithm on full-size Naval Academy ships and demonstrate an effective defense system that can be used in an actual maritime invasion.

"We are interested in situations where an intruder tries to outmaneuver and destroy high-value ships in a harbor, and the goal of the ship is to prevent him from doing so. This is called a harbor defense problem. The defense algorithm we've developed has received attention from the Naval Academy because it is fast and the quality of the solution is good," Lee said. "It's the best/worst case solution. It assumes that the opponent is always doing their best, which puts the defender in a worst-case scenario. If we can find the opponent's best action, we can make a counteraction and allow our ships to defend the harbor successfully."

Lee has also applied his algorithms to smart car technology. He took home the top prize last fall at the Hyundai Motor Group Global Top Talent Forum, an annual competition where participants, mainly PhD students, present their research to a panel from the company and discuss ideas with their peers.

His presentation and research focused on the "Model Predictive Smart Car"—autonomous, or self-driving, cars.

At the competition, he discussed how to use his model predictive control technique to develop a smart car. The main idea in his model is to make the car smart enough to handle various scenarios rather than consider all the possible situations that might happen on the road.

Lee said that using his method could guarantee safety without sacrificing performance.

His car design included advanced smart cruise control, a lane departure warning system, a forward collision warning system, active suspension, and automatic parking.

Nine distinguished grad students named

The MechSE Department announced nine Distinguished Graduate Students for 2015. Each one of them published an impressive five or more papers last year: **Ritu Raman** (9 papers), **Venanzio Cichella** (6), **Neal Lawrence** (6), **Matthew Petrucci** (6), **Amir Farimani** (6), **Richard Kesler** (5), **Ahmad Najafi** (5), **Kewen Han** (5), and **Ronald Choe** (5). The photo at right shows them with their advisors and Department Head **Tony Jacobi**.

"The research they reported in these articles is aimed at providing a deeper understanding of physical phenomena, and using that knowledge to produce and use energy more efficiently, to improve our environment, to extend and enhance our lives, to ensure our security, and to promote innovation and economic development in Illinois, the United States, and around the globe," Jacobi said.

Startup Cast21 aims to reset broken arm treatment

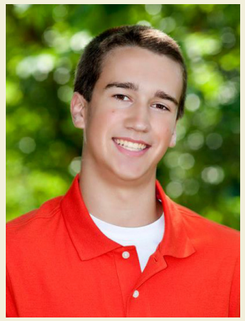
MechSE senior **Jason Troutner** has co-founded an innovative start-up intent on creating better casts for broken arms. Called Cast21, the company recently won the Saint Louis University "Real" Elevator Pitch Competition.

"It was nice because it was our first real validation of our idea as a business," Troutner said. "We've had our technology validated by experts in engineering but we didn't have any indication from outsiders in business and investing that there really was a big market potential to our product."

The team's goal was to create a more comfortable, breathable cast that will heal broken bones quickly and effectively. They came up with a lattice structure cast made out of plastic that has two electronic attachments.

The first attachment is aimed at reducing muscle atrophy and eliminating physical therapy time. When a wrist comes out of a traditional cast, the muscle mass is visibly smaller. Cast21's electrical muscle stimulation sends small electric shocks to stimulate the muscles so they don't decrease in mass.

The second attachment applies vibration therapy to the broken bone. The vibrations are small enough not to displace or damage the bone more, but would speed up the recovery process.



"The body knows to grow both muscle and bone and it senses that those muscles and bone are being used," Troutner said. "So if you're not using the bone at all it will heal, but not as quickly as when it senses these small vibrations."

The two electrical attachments only need to be applied for about 20 minutes per day.

Another benefit of Cast21's design is that the lattice structure covers the affected area, but—unlike traditional plaster casts—leaves much of the skin exposed, so the wearer can shower, swim, and exercise as much as they want.

His Cast21 co-founders are bioengineering senior **Ashley Moy** and electrical and computer engineering senior **Justin Brooks**.

MechSE Fellowships and Scholarships

Fellowships and scholarships are an important way for MechSE to attract top students from Illinois and around the world. Listed below are MechSE's scholarship and fellowship recipients for 2015-16. We congratulate these students and would like to express our thanks to the alumni and friends who made these honors possible.

MechSE Endowed Scholarships

James W. Ashbrook Scholarship
Rajan Aggarwal

A. Richard Ayers Scholarship
Fernando Hernandez-Campos

James and Loretta Bayne Scholarship
Ian Bashor
Peter Bruno

Thomas J. Breen and Gail Schaller Breen Scholarship in Mechanical Science & Engineering
Athrey E. Nadhan

Donald E. Carlson Scholarship
Xuanhui Bao
Alexander Jiskra

Bei Tse and May Chao Scholarship
Justin Hunter
William Iverson

Guy Richard Collins Engineering Scholarship
Timothy Chen
Maya D'Souza
William Enowmbitang
Thomas Gibbons
Michael Hubner
Brittany Poppen
Dante Reese

Phillip A. Dethloff Scholarship
Patrick Burke
Christopher Sanders

A. G. Friederich Memorial Scholarship in Mechanical Engineering
Evan Goedelmann

C. J. Gauthier Mechanical Science and Engineering Scholarship
Aakash Choubal
Daniel Kofman

Margaret L. Gongaware Scholarship in Mechanical Engineering
Alexandra Baumgart
Cole Brooker
Gonzalo Gutierrez Schoenmaker
Therese Marsh

Roger and Sandra Heath Scholarship
Nicholas Mark

Henneman Scholarship
Eric Staniszewski

Miles and Louise Hinsley Scholarship
Jeffrey Smith
Alex Studnicka
Jason Troutner

Illinois ME Scholarship
Stephanie Sokolyk
Charles Tierney

Erle E. Johnson Scholarship
Carly Newman

E. Bruce Kleber and Betty Hogan Kleber Scholarship
Kevin Peralta

Kaiser Aluminum Scholarship
Oluwami Dosunmu-Ogunbi
Nathan Zimmerer

Karl W. Kolb and Arden M. Kolb-DeBolt Scholarship
Allison Rymut
Daniel Wong

Arthur W. Lindstrom Scholarship
Thomas McGrath
Patrick Slade

John H. and Billie Jean Marsh Scholarship
Emily Wood

MechSE Engineering Visionary Scholarship
Theodore Reimann

Sonia Reva Metropole Engineering Scholarship
Claire Peters

Robert E. Miller Scholarship
Thomas McGrath

James E. Peters Scholarship
Alexander Lopez

Mark E. Prasse Memorial Scholarship
Kristina Kirova

Ben Jay Rosenthal Scholarship
Mary Kate Nowak
Alex Wu

Sam Sachs Memorial Scholarship
Kevin Brenner
Charles Tierney

Kent F. and Carol Ann Schien Engineering Scholarship
Gordon Zak

Mark A. Shannon Scholarship
Arturo Garcia
Jerome Sacherer

Earl and Althea Smith Scholarship
Soloman Dana

Hermia G. Soo Family Scholarship
Alexandra Klieger

Morris Stern Scholarship
Diego Gundersen

Marvin Stippes Scholarship
Monica Ngo

Wilbert F. Stoecker Scholarship
Sonja Brankovic

Thomas-Lain Scholarship
Sonja Brankovic
Aakash Choubal
Gonzalo Gutierrez Schoenmaker
Brittany Poppen
Nicolas Rebers
Jason Troutner

James R. Tucker Scholarship
Kyle Johnston
Claire Peters

Raymond and Birute Viskanta Scholarship
Chanchali Agrawal

Eleanor and Eugene Wesselman Scholarship
Christopher Marry

Steven Kyoon Yun Memorial Scholarship
Matthew Tabrizi

MechSE Annual Scholarships

William L. Fourney Scholarship
John Meyering

Julie Frichtl Scholarship
Claire Peters

Hendrick House Scholarship
Evan Goedelmann
Fernando Hernandez-Campos

MechSE Alumni Scholarship
Diego Gundersen Gonzalo
Gutierrez Schoenmaker
Caitlin Haisler
William Iverson
Jennifer Ko
Ekaterina Konova
Christine Lannon
Jenna Leane
Alejandro Morales
Anthony Morales
Carly Newman
Benita Ning
Kevin Peralta
Donald Witt

MechSE Annual Fund Scholarship
Arturo Garcia
Sam Goldsmith
Caitlin Haisler
Daniel Kofman
Christopher Marry
Athrey Nadhan
Monica Ngo
Nicolas Rebers
Karla Rivero Valles
Allison Rymut
Stephanie Sokolyk
Eric Staniszewski
Paula Stocco
Matthew Tabrizi
Shanay Thakkar
Soorya Todatry
Gordon Zak

MechSE Outstanding Scholarship
Rajan Aggarwal
Xuanhui Bao
Ian Bashor
Austin Brown
Patrick Burke
Solomon Dana
Maya D'Souza
Evan Goedelmann
Fernando Hernandez-Campos
Nicolas John
Kristina Kirova
Alexander Lopez
Nicholas Mark
Mary Kate Nowak
Nino Randazzo
Nicolas Rebers
Theodore Reimann
Tatiana Schaffer
Patrick Slade
Katie Slowikowski
Peter Tatkowski
Kevin Wandke
Carter Wood
Emily Wood
Dillon Zimmer

MechSE Corporate Scholarships

(Thank you to Chevron, ExxonMobil, Ford Motor Company, Parker Hannifin, Phillips 66, and Sargent & Lundy for generously supporting MechSE students)

Nicole Allegretti
Alex Allmandinger
Michael Bardell
Gregory Danielson
Arturo Garcia
Sam Goldsmith
Runshi Gu
John Guidone
Caitlin Haisler
Keith Harris
Michael Kabbes
Anthony Klepacki
Daniel Kofman
Christopher Marry
Andrew Mass
Athrey Nadhan
Monica Ngo
Nithin Rajkumar
Nicolas Rebers
Karla Rivero Valles
Allison Rymut
James Shindelar
Stephanie Sokolyk
Eric Staniszewski
Paula Stocco
Matthew Tabrizi
Shanay Thakkar
Soorya Todatry
Andrew Vahling
Timothy Wu
Gordon Zak
Chi Zhang

University Endowed Scholarships

James J. and M. Joan Stukel Scholarship
Thomas McGrath

MechSE Endowed Fellowships

Eugene and Lina Abraham Fellowship
Damiano Baccarella

Pat and Bette Calabrese Fellowship
Robert Donahue

Wen Lung Chow Fellowship in Mechanical Engineering
Spencer Kieffer

George A. Costello Memorial Fellowship
Joshua Stout

DeVor Graduate Fellowship
Manjunath Chinnappamudaliar Rajogopal

Thomas J. and Virginia Fisher Dolan Fellowship
Joshua Stout

C.J. Gauthier Mechanical Science and Engineering Fellowship
Andrew Patterson

Grayce Wicall Gauthier Fellowship
Suya Gao

George B. Grim Fellowship
Spencer Kieffer

Richard W. Kritzer Fellowship
Damiano Baccarella

MechSE Alumni Teaching Fellowship
Spencer Bryngelson
Purushotam Kumar
Matthew Piper
Rajavasanth Rajasegar
Louis Steytler
John Sanders

James E. Peters Fellowship
Han He

Shao Lee Soo Fellowship
Brendan McGann

Stoyke Fellowship
Jesse Evans

Sweigert Fellowship
Andrew Patterson

H.C. Ting Fellowship
Han He

William and Virginia Waterman Fellowship
Joshua Stout

W. Grafton and Lillian B. Wilkins Fellowship
Manjunath Chinnappamudaliar Rajagopal

College of Engineering Fellowships

SURGE Fellowship
Olivia Carey De La Torre
Jose Guadarrama
Matthew Robertson
Gabriela Couvertier Santos

Graduate College Fellowships

Illinois Distinguished Fellowship
Amit Madhukar

Graduate College Distinguished Fellowship
Xavier Moya
Gabriela Couvertier Santos

University Fellowships

Beckman Institute Graduate Fellowship
Hector Lopez Hernandez

Corporate-Sponsored Fellowships

FMC Technologies Fellowship
Cai Mike Wang

National Fellowships

ACC Postgraduate Fellowship
Ashley Armstrong

Department of Energy Fellowship
Eric Mayhew

NASA Space Technology Research Fellowship (NSTRF)
Taiyo Wilson

NCAA Postgraduate Fellowship
Ashley Armstrong

NSF (National Science Foundation) Fellowship
Ashley Armstrong
Anthony Fan
Gregory Hardy
Keegan Moore
Anna Oldani
Herschel Pangborn
Ritu Raman
Joshua Schiller
Rishi Singh
Donggyu Sohn
Svjetlana Stekovic
Nicolas Tobin
Matthew Williams

International Fellowships

Fulbright Fellowship
Wagar Zia

Science, Mathematics, and Research for Transformation (SMART) Fellowship
Sushikumar Prabu Koundinyan

MechSE New Faculty

The MechSE Department is proud to have added six outstanding, early-career faculty members from August 2015 to January 2016.

For new MechSE assistant professor **Amy LaViers**, discovering her interest in robotics more or less happened overnight.

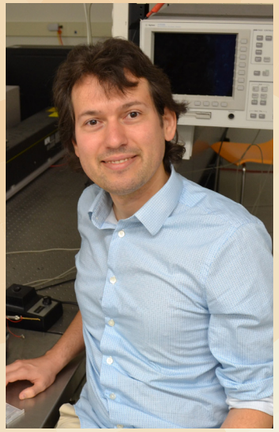
"On the last day of my junior year at Princeton, I had a control class and my dance seminar," LaViers said. "After a class on the system dynamics of bicycles and another on Twyla Tharp's choreography, it hit me—those are both control systems."

Thanks to that discovery, LaViers has since had a definitive focus for her research. She combines her two passions—mechanical engineering and dance—in a unique and useful way in her group, the Robotics, Automation, and Dance (RAD) Lab. LaViers is familiar with the art of analyzing and describing movement, and she uses this information to develop high-level abstractions for robotic control and to analyze movement quantitatively.

Assistant Professor **Gabriel Juarez** has studied at the crossroads of chemistry, physics, and mechanical and chemical engineering, looking at various aspects of heterogeneous fluid environments. Specifically, he has been intrigued by novel and unexpected phenomenon displayed in soft condensed matter systems at the micro scale.

"Much of my research involves using microfluidics and microscopes to get up close and personal with what we're studying at the small scale, quantifying what we can find from these images—things like shape and flow fields," Juarez said.

He studies soft, flexible molecules, like DNA, and how flow forces on these molecules can lead to unique mechanical properties of complex fluids. He is particularly interested in bacterial cells at the micro scale and how they interact with various interfaces—research that is useful in bioremediation efforts such as cleaning pollutants from bodies of water.

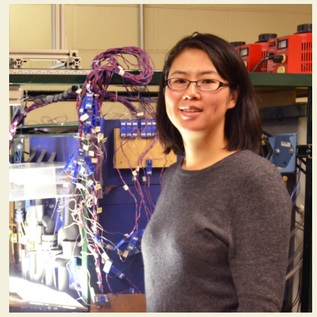


With ambition to engineer an entirely new set of electronic, photonic, and mechanical devices, assistant professor **Arend van der Zande** is researching the properties and applications of two-dimensional nanotechnology.

"Traditionally, electronics have existed on a silicon chip and can't be moved or altered in any way. Right now, the research community is trying to find ways of changing how we interact with electronics. We are trying to engineer stretchable, flexible, and reconfigurable systems, which can fit on a curved surface, or be bent, or be put inside a liquid or biological environment while still functioning."

Specifically, van der Zande's focus at Illinois is to engineer devices from stacks of disparate 2D materials. The classic example of this is graphene, which is a single atom thick sheet of carbon.

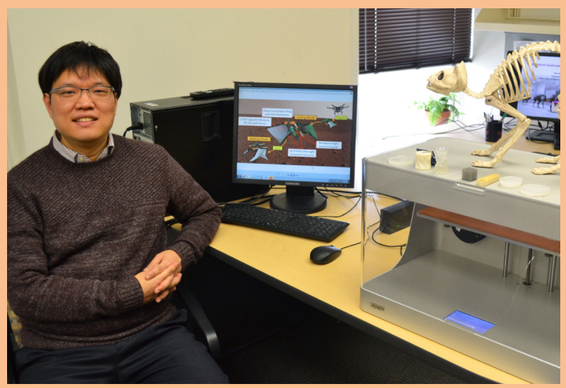
Xiaofei Wang has joined the MechSE faculty as a research assistant professor. After completing a PhD in engineering thermophysics in 2012 at Xi'an Jiaotong University in China, Wang came to the University of Illinois to undertake postdoctoral training. She previously served as an assistant professor at Henan University, where she taught courses in controls and applied math.



"My classroom instruction was always about measurement, control, and mathematics," she said. "I started to appreciate the importance of deeply understanding what you control. We learn all this high-level control and measurement, but I really wanted to understand the fundamental mechanisms of how the systems worked—especially thermal systems."

Her research focus is experimental, and it is directed at fundamental research with implications in energy conservation, power-generating systems, and air conditioners and refrigeration.

During **Hae-Won Park's** PhD work at Michigan, he conducted research on a bipedal locomotion robot named MABEL, which has been on display at the Chicago Field Museum. During his postdoctoral position at MIT, he worked on the MIT Cheetah 2, which has been featured at the Boston Technology Museum. "I am always amazed at how biological animals can maneuver dynamically with efficient movements in complex environments without significantly slowing down. The Cheetah 2 project focused on mobility and speed," Park said. "Not only could we make it run fast, we could also make it jump over obstacles while running." Park said he is intrigued by how animals are able to move without letting their surroundings slow them down. He began working with locomotion systems to incorporate dynamic animal traits—from snakes, fish, and humans, among others—into their robotic counterparts.



During Assistant Professor **Aimy Wissa's** time at the University of Maryland, she began studying flapping wing unmanned aerial vehicles (UAVs), which became the focus of her PhD work there.

"When I look at birds, I'm inspired to think about why our man-made drones don't fly as well," Wissa said. "In comparison, birds are a lot more agile and adaptable. They can easily take off, land, perch, cruise, and sometimes hover. Our equivalent in engineered vehicles is not like that, mainly because birds' wing kinematics are much more exquisite and complex. In my lab, the Bio-inspired Adaptive Morphology (BAM) Lab, we like to combine nature's solutions with our expertise in engineering and design with materials."

Wissa said her work has military applications, including surveillance for combat intelligence, as well as civilian applications, such as inspection of crops.

HOLD THE SALT

Two MechSE faculty members have each devised a novel solution to one huge global challenge

Professor Narayana Aluru

Professor **Narayana Aluru**'s team has found an energy-efficient material for removing salt from seawater.

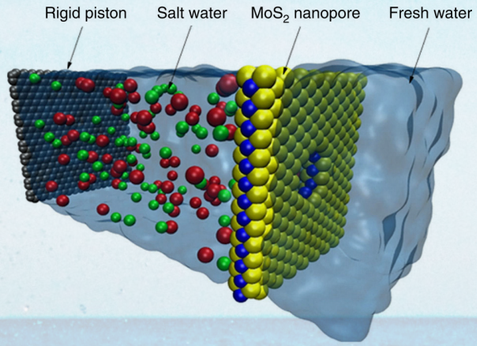
The material, a nanometer-thick sheet of molybdenum disulfide (MoS_2) riddled with tiny holes called nanopores, is specially designed to let high volumes of water through but keep salt and other contaminates out, a process called desalination. In a study published in the journal *Nature Communications*, the Illinois team modeled various thin-film membranes and found that MoS_2 showed the greatest efficiency, filtering through up to 70 percent more water than graphene membranes.

"Even though we have a lot of water on this planet, there is very little that is drinkable," Aluru said. "If we could find a low-cost, efficient way to purify sea water, we would be making good strides in solving the water crisis.

"Finding materials for efficient desalination has been a big issue, and I think this work lays the foundation for next-generation materials. These materials are efficient in terms of energy usage and fouling, which are issues that have plagued desalination technology for a long time."

Most available desalination technologies rely on a process called reverse osmosis to push seawater through a thin plastic membrane to make fresh water. The membrane has holes in it small enough to not let salt or dirt through, but large enough to let water through. They are very good at filtering out salt, but yield only a trickle of fresh water. Although thin to the eye, these membranes are still relatively thick for filtering on the molecular level, so a lot of pressure has to be applied to push the water through.

"Reverse osmosis is a very expensive process," Aluru said. "It's very energy intensive. A lot of power is required to do this process, and it's not very efficient. In addition, the membranes fail because of clogging. So we'd like to make it cheaper and make the membranes more efficient so they don't fail as often. We also don't want to have to use a lot of pressure to get a high flow rate of water."



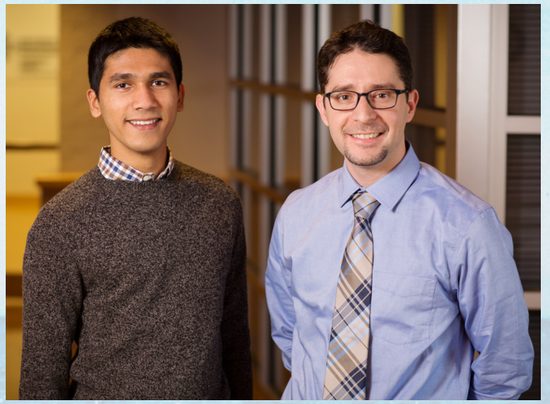
One way to dramatically increase the water flow is to make the membrane thinner, since the required force is proportional to the membrane thickness. Researchers have been looking at nanometer-thin membranes such as graphene. However, graphene presents its own challenges in the way it interacts with water.

Aluru's group, which includes grad students **Mohammad Heiranian** and **Amir Barati Farimani**, has previously studied MoS_2 nanopores as a platform for DNA sequencing and decided to explore its properties for water desalination. Using the Blue Waters supercomputer at the National Center for Supercomputing Applications at the U of I, they found that a single-layer sheet of MoS_2 outperformed its competitors thanks to a combination of thinness, pore geometry, and chemical properties.

A MoS_2 molecule has one molybdenum atom sandwiched between two sulfur atoms. A sheet of MoS_2, then, has sulfur coating either side with the molybdenum in the center. The researchers found that creating a pore in the sheet that left an exposed ring of molybdenum around the center of the pore created a nozzle-like shape that drew water through the pore.

The researchers are establishing collaborations to experimentally test MoS_2 for water desalination and to test its rate of fouling, or clogging of the pores, a major problem for plastic membranes. MoS_2 is a relatively new material, but they believe that manufacturing techniques will improve as its high performance becomes more sought-after for various applications.

The Air Force Office of Scientific Research, the National Science Foundation, and the Beckman Institute supported this work.



MechSE grad student Rylan Dmello and Assistant Professor Kyle Smith

The technology that charges batteries for electronic devices could provide fresh water from salty seas, says a new study by Assistant Professor **Kyle Smith** and published in the *Journal of the Electrochemical Society*. Electricity running through a salt water-filled battery draws the salt ions out of the water.

"We are developing a device that will use the materials in batteries to take salt out of water with the smallest amount of energy that we can," Smith said. "One thing I'm excited about is that by publishing this paper, we're introducing a new type of device to the battery community and to the desalination community."

Interest in water desalination technology has risen as water needs have grown, particularly in drought-stricken areas. However, technical hurdles and the enormous amounts of energy required have prevented wide-scale implementation. The most-used method, reverse osmosis, pushes water through a membrane that keeps out the salt, a costly and energy-intensive process. By contrast, the battery method uses electricity to draw charged salt ions out of the water.

The researchers were inspired by sodium ion batteries, which contain salt water. Batteries have two chambers, a positive electrode and a negative electrode, with a separator in between that the ions can flow across. When the battery discharges, the sodium and chloride ions—the two elements of salt—are drawn to one chamber, leaving desalinated water in the other.

In a normal battery, the ions diffuse back when the current flows the other direction. The Illinois researchers had to find a way to keep the salt out of the now-pure water.

"In a conventional battery, the separator allows salt to diffuse from the positive electrode into the negative electrode," Smith said. "That limits how much salt depletion can occur. We put a membrane that blocks sodium between the two electrodes, so we could keep it out of the side that's desalinated."

Like Professor Aluru's approach, Smith's battery approach holds several advantages over the current methods involving reverse osmosis. The battery device can be small or large, adapting to different applications, while reverse osmosis plants must be very large to be efficient and cost effective, Smith said. The pressure required to pump the water through is much less, since it's simply flowing the water over the electrodes instead of forcing it through a membrane. This translates to much smaller energy needs, close to the very minimum required by nature, which in turn translates to lower costs. In addition, the rate of water flowing through it can be adjusted more easily than other types of desalination technologies that require more complex plumbing.

Smith and grad student **Rylan Dmello** conducted a modeling study to see how their device might perform with salt concentrations as high as seawater, and found that it could recover an estimated 80 percent of desalinated water. Their simulations don't account for other contaminants in the water, however, so they are working toward running experiments with real seawater.

"We believe there's a lot of promise," Smith said. "There's a lot of work that's gone on in developing new materials for sodium ion batteries. We hope our work could spur researchers in that area to investigate new materials for desalination. We're excited to see what kind of doors this might open."

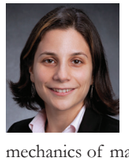
MechSE Faculty Updates

Gaurav Bahl and doctoral student **Yin-Chung Chen** devised a new method to cool solids using Raman scattering, demonstrating that a transparent material simply patterned into a photonic crystal could be cooled when illuminated by specific laser wavelengths. Their findings were published in *Optica*.

Joseph Bentsman was appointed the Chair of the Technical Committee on Power Generation of the IEEE Control Systems Society. The committee encompasses nuclear, fossil, and renewable energy generation, as well as energy utilization. It counts in its ranks about 120 leading researchers from around the world, representing industry, government, and universities. He also published an undergraduate mechanical engineering textbook titled *Introduction to Signal Processing, Instrumentation, and Control: an Integrative Approach*.

Harry Dankowicz was issued a patent for a new technology that will aid in agricultural methods and processes. The invention is a method for self-calibration of a mass flow sensing system on a combine that will allow for more accurate readings of yield and mass flow sensing. Additionally, the Illinois-Sweden Program for Educational Research and Exchange (INSPIRE), an initiative co-led by Dankowicz, was named the best international partnership in the U.S. by the Institute of International Education. He also was an invited lecturer at the New Zealand Mathematics Research Institute Summer School on Continuation Methods in Dynamical Systems in January 2016.

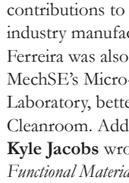
Steve Downing won the 2016 College of Engineering Teaching Excellence Award and the Campus Award for Excellence in Undergraduate Teaching. This competitive award is given annually to a faculty member or graduate TA for exemplifying outstanding teaching abilities.



Elif Ertekin was named a 2016 Early Career Faculty Fellow by The Minerals, Metals and Materials Society (TMS). She was honored for her work in building from a mixed background in the mechanics of materials and in materials physics, merging her research in continuum models of defects and plastic deformation in low-dimensional materials, with electronic structure of points defects in semiconductors for photovoltaics and other energy applications. Ertekin also received the 2016 Everitt Award for Teaching Excellence from Engineering Council. She received an NSF CAREER Award for her research, "Designing Functionality Into Two-Dimensional Materials Through Defects, Topology, and Disorder."

Randy Ewoldt won the 2016 College of Engineering Dean's Award for Excellence in Research in recognition of his exceptional research accomplishments during the previous academic year.

Placid Ferreira received the 2016 Education Award from SME. He was recognized for his efforts in developing an innovative manufacturing curriculum; his outstanding teaching and mentorship; scholarly and innovative contributions to the field; and his leadership in industry manufacturing research and education. Ferreira was also named the new director of MechSE's Micro-Nano Mechanical Systems Laboratory, better known as the MNMS Cleanroom. Additionally, he and graduate student **Kyle Jacobs** wrote a paper, published in *Advanced Functional Materials*, that demonstrates the use of an electron beam to write patterns on a specific type of conductive substrate. Their discovery furthered the development of writing with electron beam irradiation.

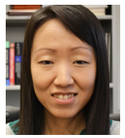


Jonathan Freund has been invited to serve as an inaugural associate editor for the new *Physical Review Fluids Journal*. His is also co-leading the Center for Exascale Simulation of Plasma-coupled Combustion, using state-of-the-art simulation based predictive science to seek novel means to use plasma technology to improve combustion.

Naira Hovakimyan was invested in a January ceremony as the eighth W. Grafton and Lillian B. Wilkins Professor of Mechanical Science and Engineering. In December, she was featured in the *New York Times* in an article highlighting the $1.5M NSF grant she received for her robotic drones that will assist the elderly in their homes, giving them more independence and the ability to live at home longer. She is also developing small autonomous robots that can assist people with household tasks as well as connect with them on a personal level.

Predrag Hrnjak was selected to receive the 2014 ASHRAE Technical Paper Award for his paper "R410A Maldistribution Impact on the Performance of Microchannel Evaporator."

Elizabeth Hsiao-Wecksler was named MechSE's Associate Head for Undergraduate Programs, starting August 2015.



Yuhang Hu received a CAREER Award from the National Science Foundation for her research, "Mechanics and Physics at the Boundary Between Solid and Fluid: Probing the Thermodynamic and Kinetic Properties of Gels." This competitive NSF award is given to junior faculty at the beginning of their careers. She was also awarded a Haythornthwaite Foundation Research Initiation Grant from ASME's Applied Mechanics Division. This award is for faculty at the beginning of their careers who are engaged in theoretical and applied mechanics research.

Mariana Kersh was awarded a three-year grant from Zimmer Biomet, an international medical device manufacturer, to conduct research on the assessment of knee bone and cartilage after subchondroplasty procedures. Kersh's work will look at how subchondroplasty affects the knee long-term after the procedure is completed—specifically, whether it inhibits further degeneration of the cartilage, leading to osteoarthritis.

William King was featured on a widely publicized webcast with *The Atlantic* in November to talk about "Manufacturing's Digitized Future."

Seid Koric's work was published in the journals *Computer Methods in Applied Mechanics and Engineering* and *Computers & Geoscience*. He solved large real-world and ill-conditioned implicit finite element problems from multiphysics and geophysics with the Watson Sparse Matrix Package (WSMP) solver on the Blue Waters petascale computing system at Illinois' National Center for Supercomputing Applications. A typical finite element code takes many days to solve what Koric and his collaborators solved on the 65,536 cores of Blue Waters in less than a minute.

Amy LaViers was the recipient of a 2015 DARPA Young Faculty Award for her research titled, "Choreography of Embodied, Platform-invariant Motion Primitives." DARPA, the Defense Advanced Research Projects Agency, awards grants for research and technology that align with their mission of improving national security. She is also a Co-PI on the recently awarded NSF ASPIRE grant, led by **Naira Hovakimyan**, where her work will develop stylistically appropriate motions for robotic drones that will assist the elderly in their homes.

Nenad Miljkovic received an NSF CAREER Award for his research, "Investigation of Nucleation Dynamics on Nanoengineered Surfaces for Durable and High Heat Flux Condensation Phase Change Applications."

SungWoo Nam was awarded a grant from the Air Force Office of Scientific Research (AFOSR) Young Investigator Research Program (YIP) for his research project, "Reconfigurable, Corrugated Graphene Plasmonics." The YIP program funds scientists and engineers across the country who received their PhD in the last five years and show promise for conducting research. He also received a prestigious NSF CAREER Award for his research on "Shrink Nanomanufacturing of Corrugated Graphene Structures," given to faculty at the beginning of their academic careers and emphasizing high-quality research and novel education initiatives. Additionally, Nam's new findings related to novel "crumpling" of hybrid nanostructures was published in *Nano Letters*, and has been highlighted as the Editor's choice in other high-impact journals, such as *Nature Nanotechnology*, and *Materials Today*.

Martin Ostoja-Starzewski gave the Warren Lecture at the University of Minnesota, a Center for Nonlinear Studies Colloquium at Los Alamos National Laboratory, and an Applied Mathematics and Computational Science Colloquium at the University of Pennsylvania, all on modifying the continuum physics so as to account for violations of the second law of thermodynamics. He also gave a keynote lecture (co-authored by his student Jun Zhang) on homogenization of random viscoelastic media at the 52nd Annual Technical Meeting of the Society of Engineering Science.

Taher Saif was named MechSE's Associate Head for Graduate programs, starting August 2015. He also hosted leading mechanobiology scientists from around the world for an impactful workshop, "Cell/Matrix Mechanobiology: Current State and Future Directions."

Huseyin Sehitoglu was named an Honorary Member of DVM (Deutscher Verband für Materialforschung und –prüfung e.V.), the German Association for Materials Research and Testing. This recognition has been given to fewer than 30 people since 1987. The Board elects one Honorary Member every four years. He is also the founding editor of a new journal called *Shape Memory and Superelasticity* published by American Society of Metals International and Springer.

Kelly Stephani was selected as one of eight recipients for the NASA Early Career Faculty Award. She was selected for her proposal, "A Phase-Space Coupled Hybrid Framework for Combined Continuum/Rarefied High Speed Flows," which focuses on NASA's programmatic need for advanced aerothermodynamics modeling capabilities.

Sameh Tawfick was named a 2016 Outstanding Young Manufacturing Engineer by SME. The award recognizes engineers age 35 or younger for their exceptional contributions and accomplishments in the manufacturing industry. Tawfick was honored for his excellence in the development of new manufacturing processes to produce 3D microstructures and casting of continuous metal nanowires for compliant electro-mechanical systems.

Kimani Toussaint was one of only 30 participants from the U.S. selected to attend the National Academies' third Arab-American Frontiers of Science, Engineering, and Medicine in December 2015. He also recently led a team, which included MechSE professor **Harley Johnson**, in developing a new approach to fabricating flat, ultrathin optics with a nanostructured template and an etching technique that does not use acids or hazardous agents. The method enables the creation of various optical components without the need for repeatedly using a cleanroom. His work was published in the February issue of *Nature Communications*.

Amy Wagoner Johnson was nominated and selected to participate in the College of Engineering Faculty Leadership Forum for academic year 2015.

Matt West was awarded the 2016 Collins Award for Innovative Teaching from the College of Engineering in recognition of his leadership in the development of new and innovative teaching methods to improve the undergraduate curriculum.

Working with the campus' Center for Innovation in Teaching and Learning (CITL), West video-recorded Fighting Illini gymnast Giana O'Connor performing a variety of moves on the uneven bars. The resulting video footage and explanation of the concepts will be incorporated into a campus MOOC (Massive Open Online Course) for TAM 212, and West also plans to use it for the traditional version of the course.

"Keurig meets crockpot" in food tech startup

Thanks to the work of the food tech startup Tovala, kitchens across the country are closer to an appliance, which promises individual, gourmet meals in less than 30 minutes.

In January, Tovala announced $500,000 in seed funding. The company is perhaps the most visible result to date of the partnership between the University of Illinois at Urbana-Champaign College of Engineering and the University of Chicago's Booth School of Business. Last spring Tovala, under the name "Maestro," earned the University of Chicago's annual New Venture Challenge first prize. Co-founders **Bryan Wilcox** (PHDME '11) and **David Rabie** described their fledgling creation as "a Keurig meets crockpot."

A native of Los Angeles, Rabie's background is mostly in the food industry. Wilcox, the company's chief technology officer, completed his PhD in mechanical engineering from Illinois and then started The Product Manufactory in 2012, where he continues to serve as President.

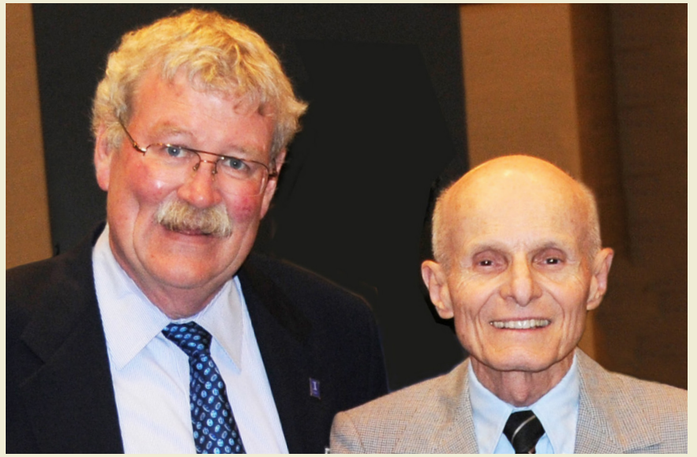
Bryan Wilcox

"All of our engineering talent is either out of the U of I or closely tied to the U of I," said Rabie, who was a part of the first collaboration between Booth and Engineering at Illinois in October of 2014. "That meeting opened my eyes to the potential and I kept my ears to the ground for engineering talent from Urbana-Champaign. It is something that we are particularly proud about, especially considering our investors are tied to both universities."

Tovala (a combination of the Italian word for table, "tavola," and the Hebrew word for good, "tov") is targeting urban professionals and partnering with food companies. Consumers will have the option of thousands of meal choices and the opportunity to sign up for meal plans, which are designed to serve 1-4 people. All the ingredients necessary—raw, pre-prepped, and made from scratch—will be delivered to their doors. Examples of recipes available include ginger pork with rice noodles, roast chicken with a fall vegetable medley, and chicken pozole with avocado.

When the user is ready to heat, they just take it out of the refrigerator, scan the bar code, and insert the food. The appliance will get information from the cloud on how to prepare it, which could be a combination of baking, broiling, steaming, and convection heating. It will have accurate temperature controls over each of those functions with the ability to automatically switch between them. Users will get a push notification on their phone when the meal is ready to eat.

"We're taking a heating technology that has existed in high-end commercial kitchens for quite some time and basically bringing that to the consumer space and automating it," Rabie said. "Right now people have to make a compromise. Either they are sacrificing health, taste, or convenience when making their food choices. The goal with Tovala is to solve for all of those equations."



Robert Miller (BSAE '54, MSTAM '55, PHDTAM '59) has been a member of the department's faculty since 1959. It is Professor Miller's legacy as a gifted teacher, advisor, and mentor that inspired **Edward Caulfield** (BSME '72, MSTAM '74, PHDTAM '79) to establish the Robert E. Miller Scholarship in 2015. This fund was established to forever honor Professor Miller's superb teaching skills and excellence in working with students.

Marcus B. Crotts (BSME '56) has been honored by the Association for Manufacturing Technology for his outstanding leadership and lifetime dedication to manufacturing technology. For 57 years, he led Crotts & Saunders Engineering, Inc., a consulting firm recognized throughout the world for its impact on manufacturing processes through improved basic design methodologies in the machine tool and manufacturing industries. Crotts has also received on of Rotary International's highest awards, the Arch C. Klumph Socity Award, recognizing his many contributions to Rotary's humanitarian efforts.

John Nunnery (BSME '80) was appointed a Vice President of Sargent & Lundy LLC. Based in the firm's Phoenix, Arizona, regional engineering office, he is responsible for directing modification projects for multiple operating nuclear power plant units. Sargent & Lundy LLC is a worldwide leader in professional services for the electric power industry and has been dedicated exclusively to serving electric power and energy intensive clients for 125 years.

Karen Thole (BSME '82, MSME '84), professor and department head of mechanical and nuclear engineering at Penn State, has been honored with the George Westinghouse Gold Medal from the American Society of Mechanical Engineers (ASME). Thole was selected for her outstanding contributions toward better cooling of gas turbine airfoils, particularly the discovery of a leading-edge fillet to reduce vortices in airfoil passages and the development of physics-based correlations used by industry for predicting micro channel cooling and film cooling.

New MechSE alumni board members

Heidi Larsen (BSME '81) is the Vice President of Global Alliances with SOASTA, Inc. in Mountain View, California. She has been a speaker for the Society of Women Engineers in the College of Engineering at Illinois, and continues to be an avid advocate for girls and women in STEM careers.

Madison Whitt (BSME '13) works as a Mechanical Contact Engineer at ExxonMobil's refinery in Joliet, Illinois. While on campus Madison was awarded the Bronze Tablet and named to the University's Senior 100 Honorary. She continues to support MechSE by serving as an alumni speaker at department events, classes and summer camps for high school students.

Larry Ziemba (BSME '77) is Executive Vice President, Refining, for Phillips 66, a diversified energy manufacturing and logistics company. He was honored with the 2015 College of Engineering Alumni Award for Distinguished Service and was named a 2014 Distinguished Alumnus of the Department of Mechanical Engineering.

MechSE Corporate Partners

Our strong partnerships with corporations, foundations, and professional organizations have created an important source of support for MechSE. Grants and gifts provide scholarships and fellowships, restricted or unrestricted support, facility improvements, and student project support. Our corporate connections often begin through our relationships with company's employees, typically alumni. We are proud to acknowledge the organizations here, which have supported MechSE programs over the past year.

Bolded listings = $25,000+ donors.

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- Support student groups like Society of Automotive Engineers, Pi Tau Sigma, Society for Experimental Mechanics, American Society of Mechanical Engineers, and others to interact with students.
- Join us for our Corporate After Hours, held on campus each semester for a chance to recruit MechSE students directly.
- Sponsor a Senior Design Project and have students work directly on your company's current projects.
- Sponsor the Innovation Studio and help our students to achieve their potential.

For more information contact **Meg Graybill**, Coordinator of Corporate and Alumni Relations mgbill@illinois.edu – 217-300-2518.

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The spirt of philanthropy, so much a part of the American heritage, empowers our quest for excellence. Again and again, with pride and gratitude, we write or speak these words: "It was made possible through the generosity of alumni and friends." You have helped make Mechanical Science and Engineering at Illinois what it is today, and your philanthropy is what will make our future so bright.

July 1, 2014 – June 30, 2015

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Cara A. Monroe
Richard Nechtow
Janice C. Olson
Robert L. and Jane A. Peddicord
Earl and Marcia Prasse
Roger E. Rhodes
Darin J. and Wendelin M. Rich
Janice L. Rideg
Robert C. and Joanne Ryan
Susan M. Saba
Juan Pablo Salas and Fatima T. Husain
Dilip V. and Sandhya D. Sarwate
Lui R. and Shirley S. Sha
William T. and Joanne Y. Sha
Osanna Shahbazyan
Karen E. Smith
Lydia M. Soo
Jim and Michelle D. Stapleton
Patrick E. Sullivan
Ralph R. and E. Jane Swarr
Lily C. Tang
Juanita R. Taylor
Marcella Lee Vancil and D. Scott Stewart
Glen A. and Judith Watford
Henry G. and Pamela Albee Way
Yan Wu and Zhiqiang Ma
Randy Y.N. Yang
Joanna W. Yeh
Pen C. and Wen Hong Yew
George T. and Priscilla C. Yu
Yisheng Zhang
Likun Zhu

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Robert J. Hartman
Clarence M. McClymonds
Wayne A. and Miriam Ring
Charles A. Sweningsen

1950s
Naim Z. and Beverly J. Azer
Leonard M. Bartosik
Herbert S. Bistritz
David Lee and Barbara Sue Carlson
Leonard J. Carlson
Kenneth R. Carroll
James O. and Joretta A. Chambers
Michael M. Chen
Marcus B. Crotts
Willis D. Dillon
James D. Eaton
Marvin W. and Barbara A. Ehlers
Calvin C. Frantz
John H. and Mariana D. Grimson
Emmanuel F. Guyon
Carl R. Hillman
Gerald L. Jenkins
Frederick D. Ju
Joseph F. and Patricia A. Kennell
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Fred N. and Joyce A. Krull
John F. Krupka
William H. Lahrman
Brace H. Lambert
Harvey W. Liberman
Gustav R. Lofgren
Kenneth R. Lohbauer
Gary B. and Helen U. Miner
William C. and Margaret I. Mohr
Lester D. Moore
Karl S. Pister
Joseph A. and Rosemary A. Plamondon
Daniel Post
Robert N. Quade
Robert H. Rollins II
John R. Ross
Charles T. and Mary Goodman Schmidt
Jay A. and Kathryn M. Severance
Clair C. Trefz
Philip V. and Barbara A. Voorhees
James W. and Helen M. Voth
Roger K. Wadsworth
Norman E. and Carol Jean Wandke
Albert A. Zagotta

1960s
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Richard B. Adams
David R. and Bonita K. Anderson
Ronald M. Bajt
Thomas J. Bander
E. C. Blomeyer
Melferd A. Bose
Donald E. Bressler
Frank H. Brittain
Eugene F. Brown
Larry E. and Jo Ellen Campbell
Orvel W. and Karen J. Clausen
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Ronald Lee Devaisher
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Archie M. Doering
John A. Dystrup
Phillip H. and Joan R. Fisher
Donald H. Frenzl
Joseph Harry Golant
Raymond J. Golik
Ronald J. and Brenda Haky
John D. Helfinstine
James L. Hill
Michael P. Hills
Mikio Ishimaru
Ronald H. Krasnitz
Gerald J. Krupp
James R. Lobitz
Robert J. and Peggy L. Malnar
Arlan G. Martin
Jerry N. Mason
Norman J. and Mildred M. McCormick
Victor J. Melville and Margaret L. Sellers
Thomas E. Murley
Robert J. and Susan S. Nikolai
Wallace W. and Julia F. Noll
Donald W. Pacer
Garrett J. and Barbara E. Pardekooper
Linn A. and Sharon L. Peterson
Henry J. Petroski
Donald J. Render
Larry Ivan Ross
David E. and Sonia B. Russell
Martin H. Sadd
Mostafa A. and Naoko Shirazi
Tom R. Simovich
William G. Steiner
Karl K. Stevens
Byron W. Stutzman
Benedict C. and Alice M. Sun
Richard B. Thomson
Frank R. Vigneron
Robert A. and Wilma F. White
George F. Zehner, Jr.

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Timothy R. Bennington
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David M. Connor
Marlin D. and Ida E. Crown
John F. Curtis
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Alan S. Duncanson
William D. and Claudia H. Fischer
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Bruce E. and Susan C. Shevlin
Mark A. Snowden
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Gary S. Walgenbach
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Robert L. and Angela M. Bayne
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Teresa A. Bontrager
Wayne F. Boothe
Thomas P. Brand
Jeffrey R. and Diane T. Brassel
John J. and Joann B. Brown
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Liming Chang
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James P. Creaser
Mark A. Curley
Jose V. Eguiguren
Michael E. Erickson
Craig S. Espevik
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Michael W. Gillman
Mark S. Goodin
Charles L. and Anita Gustafson
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David W. Kuntz
Kun-Ho Li
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Christopher L. and Paula R. Markos
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Lee R. Rieser
Ronald C. Schneider
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Russell D. and Linda M. Skocypec
Corbett T. Smith
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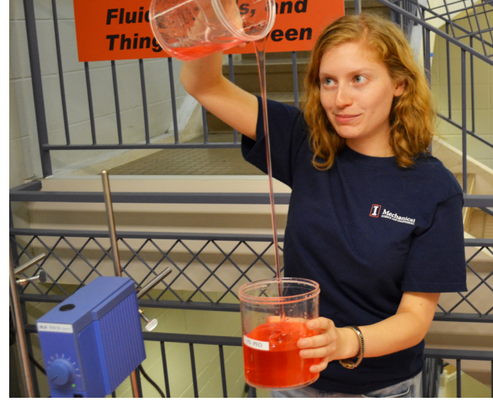

Michael S. and Dawn M. Szatkowski
Daniel M. Tarkoff
Eric J. Tuegel
Steven A. Velinsky
Albert J. Wavering III and Gail A. Wavering
Paul R. Wyness
Jeanne C. Yu

1990s
Johannes Aumack Aubrecht
David J. and Alice M. Bjork
James N. Brouillette
Joel P. Busker
William E. and Amber J. Chapman
Brad and Davon Taylor Cook
Edwin D. Dair
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Michael J. Stone
Joshua P. Styron
David C. Thoman, Jr.
Daniel M. Thompson
Ping-Ho Tsai
Patrick Ulysse
Daniel J. Weinacht
Jennifer M. Wondrasek
Anson Wong and Shuk Ying Lau
David K. and Carolyn E. Zerkle
Chao Zhu and Anqi Zhou

2000s
Marika N. Alexakis
Badrinarayan Athreya
Timothy A. and Raeanne J. Bazyn
Barry D. Beetz
Ramesh Chandrasekharan
Zhiqun Deng and Ying Yu
Shawn F. Harnish
James G. Jackson
Emad W. Jassim
Paul A. Kawka
Michael C. Keir
Thaddeus J. Kiedaisch
Jacob A. Langford
Bong G. Lee
Min Li
Tom McKinley
Benjamin E. Newell
Nicholas J. Ploplys
Justin L. Roy
Christopher M. Schuman
Thomas Simek
Michael L. Smotrys
Peter G. Strittmatter
Andrew Stubbs
Marina L. Tharayil
Satya N. Varadhan

2010s
Henry Africano
Xiangyu Dai
James T. Davis IV
Alexander P. Dressler
Daniel T. Gualandri
Christopher C. Herrera
Prashant Jayaraman
Bradley J. Jones
Valeria I. Laguna
Ki Sung Lee and Jungmin Kwon
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Guanyang Luo
Patrick T. Lynch
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Kathryn M. Neville
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Madison M. Whitt
Gina M. Zak

THE CAMPAIGN TO Transform MEB

Education. Innovation. Community.

As announced in MechSE's Fall 2015 magazine, the department has begun its **Campaign to Transform MEB**, a truly historic project for MechSE and its students, alumni, faculty, and staff. It entails a large addition to the east of MEB, a smaller addition to the north, and a massive renovation of space—66,000 square feet!—within the existing building's walls.

We will continue providing updates as the project moves forward. Below, in our first "spotlight" on one aspect of the project, we provide more information on the incredible classrooms that will be included. Completion of the project will allow us to continue doing what we do best: develop successful future leaders in engineering who will be major contributors to moving the world forward.

Active Learning Classrooms

Advanced, technology-rich teaching methods—which become possible only within "active learning" classrooms—have resulted in vast improvements in student education by utilizing truly collaborative learning. These activities require students to co-construct knowledge and engage in authentic problem-solving activities, not merely solve a problem in a group that could be solved by an individual student.

"We know from national data sources that collaboration and the ability to solve problems through teamwork are among the top skills employers are looking for in graduates from all disciplines," said **Michel Bellini**, PhD, the Director of the Center for Innovation in Teaching & Learning (CITL). "These new classrooms designed to support collaborative learning with enhanced technologies are an important part of that dynamic."

These spaces allow for point-of-instruction learning assessment, dynamic team building, and optimized classroom work that traditional classrooms do not allow. Not only do students receive a better education, but they learn how to work in groups and share their knowledge, raising their teams' potential far beyond that of individuals working alone—and preparing them for the collaboration they will face in their work after graduation.

"I am thrilled with the enthusiasm in MechSE for innovation in undergraduate education across the curriculum," said **Laura Hahn**, PhD, the Director of the Academy for Excellence in Engineering Education. "These new learning spaces will not only provide students with unprecedented opportunities to develop their skills, but will also unleash faculty creativity and motivation to devise novel projects, group assignments, and other innovative learning experiences."

Current project plans include eight active learning classrooms, ranging in size from 40-student occupancy to 160-student occupancy, the latter of which will be the largest at the University of Illinois.

From the Fall 2015 meeting of the MechSE Alumni Board, attending members were (back row, from left): Thomas McCarthy, Hugh Abrams, Patrick McAuliffe, David Wright, Brian Beaird, Barry Butler, Michael Kessler, Joseph Powers, and Mark Woodmansee. Front row, from left: Zachary Kaplan, Thomas Castino, Thomas Donovan, Marina Tharayil, and Eric Brown.

Not pictured: Krishna Jonnalagadda, Robert Kipp, Heidi Larsen, Walter Lohmann, Michael Mitchell, Sue Shimoyama, Karen Thole, Raymond Viskanta, Madison Whitt, Jamal Yagoobi, Rong Zhang, and Larry Ziemba.

Help us Transform MEB today!

We are beyond excited to announce that the Transform MEB fundraising campaign is off to an incredible start—thanks to the generosity of our alumni and friends. In addition to the project-launching $12 million gift from **Sidney Lu** (BSME '81), two gifts from late 2015 were so inspiring that we wanted to share them in this magazine.

The first gift became a reality during the September 2015 meeting of MechSE's alumni board, which is made up of a wide variety of former students who have all taken a strong interest in helping the department sustain its excellence. At this meeting, the board members announced to MechSE staff that they would invest in the project by making a six-figure donation to the Transform MEB campaign.

"For decades, this has been one of the best engineering programs in the country and, as alumni, we owe it to future generations to make sure this tradition of excellence continues," said alumni board president **Tom Donovan** (BSME '82). "We are excited to be part of this transformational project, and our gift is an important investment in the quality of the program. We encourage all MechSE alumni to also consider supporting this project, which will help us keep the program elite for many years to come."

The second gift—an incredible $2 million donation!—came from an anonymous source. It was given to the department as an unrestricted gift with the only stipulation that it should have a strong impact on the education provided in MechSE. Department Head **Tony Jacobi** immediately knew how to leverage it for maximum benefit.

"There was no question in my mind; this gift would go toward the Transform MEB project," he said. "As great as our education has been literally since the department has existed, it will advance by light years when the new building project is completed. This project will impact each and every one of our students, each and every day of their college lives."

Please contact us to find out more or get involved:

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Giving a gift to MechSE online is simple and secure. Just go to **mechse.illinois.edu/giving**.

Keep in Touch

Keep up to date with the MechSE Department! Just go to **mechse.illinois.edu/contact** to sign up with your current contact information or email us at **mechse-advancement@illinois.edu**.

Attention Entrepreneurs!

MechSE wants to hear from all of our alumni who have started their own businesses. Please contact us at **mechse-advancement@illinois.edu**, and provide a short description of your company. We will share this information in a future publication.