ENGINEERING AT ILLINOIS

Spring 2015

# Mechanical

## SCIENCE AND ENGINEERING

### The Faculty Boom of 2014-15

### ME 370: Engineering outside the box

# Mechanical
SCIENCE AND ENGINEERING

24 Alumnus Tom Korder at Penrose Brewing Company.

## Features



## News & More




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15 MechSE undergrad Madison Heimerdinger at NASA headquarters.

8 Assistant professor Kyle Smith in his lab space in MEL.

# From the Department Head

As some of you already know, I am wrapping up my tenure as MechSE Department Head, a journey I started in August 2009. This has been the most challenging and rewarding period of my career, and I believe the department is on an upward trajectory that will continue far into the future.

As you saw on the front cover of this magazine, we have a larger than usual class of new faculty members this year. In August 2014 we welcomed **Alison Dunn**, **Paul Fischer**, **Shelby Hutchens**, **Mariana Kersh**, **Nenad Miljkovic**, **Kyle Smith**, and **Kelly Stephani** to MechSE, and we were thrilled to bring in such an amazing group of high-caliber researchers and educators. There is a waiting list of exceptional students wanting to join our department, and growing our faculty is one of the key ways we will be able to meet this demand.

I think you will enjoy reading about the MechSE Department's Engineering Mechanics program. Smaller than the Mechanical Engineering program, it is just as reputed and its graduates are heavily sought after. You probably will be surprised by some aspects of EM and will enjoy reading what faculty members and administrators from some of our peer institutions have to say about it. We also want to let you know about the ways our current faculty are pushing education forward and upward, particularly in the foundational TAM courses and the hands-on design courses in mechanical engineering.

Of course, the ones who really energize the classes and labs throughout the department are the incredible MechSE students. From their involvement in research to exciting internships and even blogging for the MechSE website, our students forge their way down untraveled and impressive paths.

Our alumni are achieving amazing and unanticipated things (as usual!), from running for governor to running professional sports teams, and from launching a microbrewery to producing a pre-Broadway musical. You can read in-depth about some of these alumni and their accomplishments, which continue to make us proud.

It's been an incredibly rewarding experience to lead a department of this stature. However, I must return to my research and teaching. I have informed Dean Cangellaris of my plans, and the search for identifying my successor is progressing well. I am very grateful that I could be right in the middle of the MechSE action for more than five years, and I want to thank all of you who helped me along the way. With an incredible group of alumni—and students, faculty, and staff who are the strongest I have seen in my 25 years here—MechSE is poised to continue its tradition of excellence and achievement. I will enjoy watching it happen.

With best regards,

Placid Ferreira
Department Head
Tungchao Julia Lu Professor

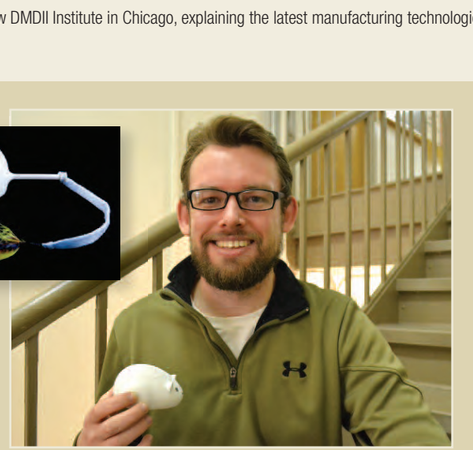
# In the News

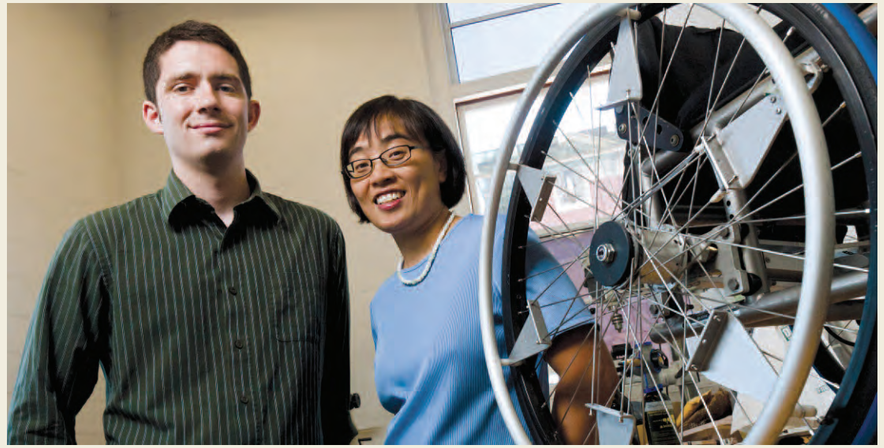
MechSE professor **William King** was on hand for the official groundbreaking ceremony of the new DMDII Institute in Chicago, explaining the latest manufacturing technologies to government leaders and other attendees.

Alumnus **Steffen Peuker** (MSME '06, PhDME '10) joined the mechanical engineering department at Cal Poly as an endowed professor in heating, ventilation, air conditioning, and refrigeration.

Alumnus **Scott Daigle** (BSME '09, MSME '11) and his startup company, IntelliWheels, have received a $1.5 million grant to advance development of ultra-lightweight, multi-geared wheels for manual wheelchairs. Located in the University of Illinois Research Park, the company collaborates with MechSE associate professor **Elizabeth Hsiao-Wecksler** and her Human Dynamics and Controls Laboratory.

MechSE graduate student **James Pikul** is part of a team (including ECE and MatSE alumni) that has developed Mousr, the first artificially intelligent cat toy. As a cat plays with the toy, it learns the cat's behavior and hunting techniques, and then adapts its movements to match that play style. In November 2014, Mousr surpassed its $100,000 Kickstarter campaign goal in less than a month, becoming an online sensation in the process.






Already the owner of the Jacksonville Jaguars of the NFL, alumnus **Shahid Khan** (BSIE '71) purchased the London soccer club Fulham of the Premier League.


Alumnus **Dan Caruso** (BSME '86), shown here (second from right) celebrating with his family, took his telecom company Zayo Group Holdings public in October. Founded in 2007, Zayo has built a massive fiber-optic network to be used by data centers, office buildings, and wireless companies.

MechSE graduate student **Adam Tilton**, Associate Professor **Prashant Mehta**, and their startup company, Rithmio, have attracted $650,000 in financing for their gesture-recognition technology that can be used in wearable electronics. They are shown here after winning the Illinois Innovation Prize and Cozad Competition in May 2014.

Alumnus **Neel Kashkari** (BSME '95, MSME '98), shown here marching in the 2014 San Diego LGBT Pride Parade, ran as the Republican nominee for governor of California in 2014, losing to incumbent Jerry Brown.

# Think you know EM?

Engineers across the U.S. share their thoughts on Engineering Mechanics at Illinois

**EM by the Numbers**

**50%** of EM majors participate in undergrad research

**35%** of EM majors go on to grad school

**4.05 YEARS** on average to graduate for EM majors

## EM for Grad School

**"We value Illinois Engineering Mechanics students because they are very strong in the fundamentals and have an appreciation for complex problems and research."**

Juan G. Santiago, Professor of Mechanical Engineering, Stanford University

**"I look for Illinois Engineering Mechanics students for my graduate program at Caltech because they are well trained, motivated, and strong in fundamentals."**

Kaushik Bhattacharya, Executive Officer for Mechanical and Civil Engineering, California Institute of Technology

**"Among the strongest applicants to our graduate program at MIT are those from the Engineering Mechanics program at UIUC. The rigor, breadth, and depth of their education provide them with a very strong foundation on which to build a career in research."**

Rohan Abeyaratne, Quentin Berg Professor of Mechanics, Massachusetts Institute of Technology

Each year, about 100 of MechSE's 900+ undergraduate students work toward a degree in Engineering Mechanics (EM).

And year after year, seniors in EM find they have a great array of post-graduation opportunities, particularly from top graduate programs.

"We are looking for Illinois Engineering Mechanics students for our graduate program at Caltech because of their excellent preparation and their potential to undertake advanced research," said **G. Ravichandran**, Director of Graduate Aerospace Laboratories at the California Institute of Technology. "They are proven to be exceptionally bright and have outstanding communication skills."

With its roots in physics and mathematics, engineering mechanics forms the basis of understanding for the behavior of fluid systems, solid structures, and complex physical phenomena. It is the study of forces that act on systems across a wide range of sizes, from atoms to global weather patterns, and the resultant behavior that those systems experience.

Engineering mechanics provides the "building blocks" for conceptualizing the design and analysis of societally relevant systems used in energy, transportation, health care, and national security.

"I wanted to be an engineer who was going to research new technology to solve new problems," said **Greg Wilk** (BSEM '13), who is now in graduate school at Georgia Tech. "So I picked Engineering Mechanics because it had more theoretical background and science classes so that I could learn more about the physical world and use those concepts to research new technology."

The EM curriculum is similar to ME in its freshman-level courses, but it soon delves deeper into math, physics, and the mechanics to solve real-world engineering problems. Advancing their expertise even further, a large number of EM majors join research groups as undergraduates, and every EM student focuses deeply on a specialized area—one of the EM "secondary fields."

Secondary field options include biomechanics, computational mechanics, engineering science and applied mathematics, experimental mechanics, fluid mechanics, mechanics of materials, and solid mechanics. EM students can also choose to customize their own secondary field with an advisor, which is actually the most popular option.

"Engineering Mechanics students get a strong background in continuum mechanics and computational mechanics, which are powerful tools to solve engineering problems," said **Emad Jassim**, MechSE's director of undergraduate programs. "This gives EM students in MechSE the necessary background to focus on a secondary field of their interest."

Senior **David Drewniak**, the 2014-15 president of the Society of Engineering Mechanics student organization, customized a track in energy systems.

"I like the idea of being energy efficient and trying to build the most efficient system possible," Drewniak said. "I researched the courses I'd need and then got it approved by Dr. **(Mariana) Silva**."

While Drewniak plans to attend graduate school after attaining his BS degree, many EM graduates decide to head straight to industry—where, like their ME peers, they find themselves very well qualified.

MechSE's mechanical engineering undergrad program routinely ranks in or near the Top 5 ME programs in the U.S. But what makes the MechSE Department so unique is that it also has a standout EM program, a rarity among top U.S. schools.

And behind the scenes, EM majors are taking advantage of incredible opportunities that literally can be found nowhere else.

"I look to recruit Illinois Engineering Mechanics students into my laboratory at Michigan because they're well prepared for graduate work thanks to the rigorous course load in mathematics and mechanics at Illinois, and I know they can succeed here," said **Ellen Arruda**, a professor of mechanical engineering at the University of Michigan.

Between their secondary fields and opportunities in research that students enjoy while still undergraduates, EM holds great appeal for the right students and often allows them to align their studies with their passions. And whether EM students pursue academia, industry research and development, or something entirely different, they are uniquely prepared.

"We give our EM students incredible tools," said Professor **Andrew Alleyne**, MechSE's associate head for undergraduate programs. "This program is really a fantastic route."

## EM in Industry

**"I find myself using the analytical skills I learned in the Engineering Mechanics program every day. In order to maximize productivity and efficiency, I need to be able to understand the core of many engineering problems. I very often find that a solution to these kinds of problems is rooted in the EM principles taught at U of I."**

Thomas Neff (BSEM '10), Manufacturing Process Improvement Engineer, Thomas Engineering, Inc.

**"My time in the Engineering Mechanics program was very important to me because the program stresses the importance of problem solving when the problems don't lend themselves to neat, tidy, and precise answers."**

Roger Plummer (BSEM '64), CEO (retired), Ameritech

# Faculty boom

## MechSE strikes gold with new high-caliber professors

With MechSE's student enrollment numbers reaching all-time highs, the department sought to bring in more new faculty members in 2014 than in recent years, while maintaining the same high standard in the caliber of the new hires.

Done and done.

Seven new professors were on board for the start of the fall semester, spurring excitement from the MEB hallways all the way to Engineering Hall.

"These hires are exciting for two key reasons," said Dr. **Andreas Cangellaris**, the Dean of the College of Engineering. "They help us grow the diversity and the overall size of the already vibrant faculty, which is crucial to MechSE plans in the coming years. And, just as importantly, they strengthen the department in a number of emerging areas that are at the heart of the campus strategy like new energy systems and research at the intersection of engineering and medicine."

The group brings expertise in a wide array of specialties and burgeoning fields. With 56 tenured and tenure-track professors now in MechSE, the current student-faculty ratio and quality of education are setting an impressive standard.

"These new faculty members are passionate about topics that our students are passionate about," Cangellaris said. "We're thrilled to welcome such top talent to teach, inspire, and mentor tomorrow's engineers and innovators."

### Alison Dunn

After finishing her master's degree in mechanical engineering at the University of Florida, Assistant Professor **Alison Dunn** sought a temporary break from engineering. So, she and her husband spent two years in China with the Peace Corps, teaching English to students. While it served as a break from her studies, it solidified her interest in teaching.

*(continued)*

From left: Kyle Smith, Kelly Stephani, Nenad Miljkovic, Mariana Kersh, Shelby Hutchens, Alison Dunn, and Paul Fischer.

"I did a lot of thinking about approaches to teaching, because the Peace Corps volunteers in China not only teach English, but teach critical thinking and teaching methods," Dunn said. "So I came back to pursue PhD research, and that's how I came to academia."

Dunn specializes in "non-traditional tribology." Whereas tribology, the study of surfaces moving against each other, is usually associated with manufacturing processes, she is more interested in biological tribology.

Part of Dunn's research focuses on the tribology of a contact lens system. The hydrogels of a contact lens are designed to operate against the fragile tissue of the cornea but also to function under the sliding interface of the eyelid, which opens and closes almost 14,000 times each day. In addition, the lens must interface with air without drying out, interface with tear fluid, and be comfortable for the wearer. Studies to improve contact lens design have mostly focused on wettability, but Dunn is pursuing a more mechanical path.

"If you have a specific contact area on these hydrogel materials, you know the load, and you can apply and test them in shear, then you can design the interface mechanics such that it provides the best lubrication," Dunn said. "You can actually start to engineer it so that the lubrication is designed into the surface of the material. That's going to help it be low-friction and robust at the same time, reduce the need for additional products, and even reduce contamination or bacterial infections."

## Paul Fischer

Professor **Paul Fischer** comes to Illinois from Argonne National Laboratory, where he had been working since 1998. Prior to that, Fischer was a faculty member at Brown University from 1991 to 1998. He received his PhD in mechanical engineering from MIT in 1989.

Fischer is an expert in the area of discretizations of partial differential equations for fluid dynamics. He has been one of the pioneers in spectral element method and of parallel numerical software.

"I've been involved in high-performance computing since the early eighties," Fischer said. "I caught the parallel computing wave early on and I've been actively involved in resolving the algorithmic challenges that have come with it."

With dual appointments in MechSE and Computer Science, Fischer is currently teaching a course on computational mechanics. His research will include work on Nek5000, which is an open source spectral element code for flow simulation that will run on anything from a laptop to a million-core supercomputer.

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Nek5000 is used by a variety of researchers around the world who are examining a whole host of areas that involve fluid dynamics. It is used in vascular flow modeling, heat transfer simulation for nuclear reactors, and modeling transport in the ocean. In addition, it is used in research of black holes, trying to understand how and why matter falls into a black hole. Uses for NeK5000 run the gamut from very close at hand to distant, interstellar research questions.

"Supporting Nek5000 is a daily activity," Fischer said. "It's a vehicle for algorithm research and for scientific discovery. Each application comes along with a new wrinkle. Somebody needs a new boundary condition or they take the code into a regime where it's not really been highly optimized. We try to analyze the numerical issues so that scientists and engineers can pursue their research questions."

## Shelby Hutchens

Assistant Professor **Shelby Hutchens** is bringing a physical chemistry perspective to MechSE. She received all of her degrees in chemical engineering: a BS from Oklahoma State University, and an MS and PhD from the California Institute of Technology.

At Caltech, Hutchens began work with polymer physicist Zhen-Gang Wang studying nucleation theory; however, she finished up her degree in Julia Greer's group exploring small-scale mechanics of materials. In this group, she analyzed the deformation behavior of vertically aligned carbon nanotube foams.

"What I got out of my graduate work was that I enjoyed working with soft materials, which was different from the rest of my group; they were all mostly working with metals," Hutchens said. "I wanted to do something more with soft materials because of all the nonlinear deformations and unique, complex behaviors that can be observed. I wanted to do something soft, and polymers are the most ubiquitous soft material that's out there."

At Illinois, Hutchens plans to continue characterizing soft materials at small scales.

"Soft materials fracture is really cool; it does amazingly different things depending on the constitutive behavior," Hutchens said. "I want to work on characterization techniques in general, because I'm also interested in developing a new class of materials that uses plants as inspiration. In plants, you have a closed-cell cellular solid that you can load with salt to establish osmotic pressure gradients across the material. Then if you put this material into water, it will deploy in some way that you have decided in advance based on how you've architected the structure of that particular solid. By tuning the material properties and the geometry, you can create a set of materials that can provide you with an inhomogeneous stress state, or an inhomogeneous strain at the surface."

Assistant Professor Mariana Kersch works on setting up her lab in Mechanical Engineering Laboratory with her students Brian Abarbanel, Hafizur Rahman, and Melissa Munanto.

## Mariana Kersh

Assistant Professor **Mariana Kersh** had a somewhat unconventional start to her mechanical engineering career: after entering the University of Texas-Austin with the intention of becoming a pre-med student, she instead obtained a bachelor's degree in English. And then she worked for almost three years in human resources, developing and editing manuals.

"I eventually decided that HR wasn't what I wanted to do, so I went back to school," Kersh said. "I figured out engineering was a better suit."

After receiving her bachelor's in mechanical engineering from the University of Wisconsin-Madison, she completed her graduate work in biomechanics there as well.

Kersh carried out her postdoctoral work in Australia, working on whole-body biomechanics. She did multi-scale modeling to use information at the macro scale, measurements made in vivo, in a model at the joint level to understand hip pathologies associated with osteoporosis. Right now her research includes developing a model of the shoulder, seeking solutions to problems that may arise in rotator cuff surgeries. She is also continuing her postdoc work by studying how bone changes with diseases such as osteoporosis.

"Biomechanics is interesting because it has both engineering and biological components to it," Kersh said. "There are students who have a natural interest in biology, like myself, but we found that our strengths were elsewhere. I think there are a lot of students who might really be suited to engineering, but they think it's just airplanes, engines, that kind of thing, and they might not know what else you can do. When you're teaching three-point bending, the traditional example is a beam. But you could easily put a bone in there and start analyzing how it breaks using the exact same equations, and if you can see that other side of the science, then one might be more motivated to consider engineering."

## Nenad Miljkovic

Deciding to study mechanical engineering for his undergraduate degree, Assistant Professor **Nenad Miljkovic** got to experience what it was like to work in industry through an engineering co-op program. During one of his co-ops he got the chance to work on a research and development project. He was immediately hooked by the experience.

"R&D was just fascinating," Miljkovic said. "You have toys, you have sensors and actuators, you have hypotheses about what you're observing, and then you get to use them all to see what happens. Most people working on R&D projects had their PhDs. Having realized this, it was a natural progression for me to go to graduate school."

Miljkovic completed his graduate work at MIT. He began by working on a hybrid solar-thermal project for his master's degree, but after helping a postdoc with some micro-nano phase-change heat transfer experiments, and seeing the

*(continued)*

fascinating and unsolved questions that remained unanswered in this field, he decided to switch to that topic for his PhD.

"I've always known Illinois was a powerhouse," Miljkovic said about his decision to pursue academia over industry. "It's a fantastic school and it was just too good of an opportunity to pass up. I would have been kicking myself for the rest of my life if I didn't take it."

Miljkovic's research involves thermo-fluid sciences, interfacial phenomena, and renewable energy. He studies how to fundamentally manipulate heat-fluid-surface interactions across multiple length and time scales to bring about transformational efficiency enhancements in energy. His research has two main focuses: fundamental research on micro/nanostructured surfaces for phase change, interfacial phenomena, and electrokinetics; and applied research on devices and systems such as solar thermal energy conversion and atmospheric energy harvesting.


Assistant Professor Nenad Miljkovic instructs students in ME 420 – Intermediate Heat Transfer. "It's been very enjoyable and rewarding. I've tried to open up the class and get to know them a bit more, and just get them to see me as more of a human being as opposed to an intimidating professor," he said. "And it's a learning process; as you're doing it, you're figuring things out yourself."

## Kyle Smith

Assistant Professor **Kyle Smith** is in the business of batteries. His research has ranged from the storage of hydrogen on board fuel-cell vehicles, to flow batteries, to devices that could eventually be used for large-scale energy storage on the electrical grid.

As a PhD student at Purdue, he created computational models to predict the morphology of metal hydride particles and analyze how the shape of the particles affected heat flow inside the material. As a postdoc, he created models of flow batteries.

"For flow batteries, it's not just the active materials that store charge that are important," Smith said. "The microstructure of current-collecting material and the battery's design affect how ionic and electronic charge flow through it, and also the mechanics of it are very important because in a flow battery the electrodes are fluids that are pumped through the battery. I was working with a new kind of flow battery that uses suspensions of solid components and solid active materials to store charge and developed, from the computational models, strategies to maximize the efficiency with which these kinds of devices operate."

Efficiency is also crucial in Smith's current research on large-scale energy storage devices. The goal is to use electrochemical-based means, including flow batteries and lithium-ion batteries, to store excess energy flowing through the electrical grid. Excess energy is a significant problem for renewable energy sources in particular, but it will only be cost-effective if they are efficient.

"Wind and solar power have an inherent intermittency to their supply," Smith said. "We can't predict when the wind is going to blow precisely, or even when the sun is going to shine with a particular intensity. When you have that energy available, you want to store it up so it can be used when it's actually demanded. The electric grid does not currently have a lot of infrastructure in this regard."


## Kelly Stephani

Assistant Professor Kelly Stephani is unique among MechSE faculty—she has a bachelor's degree, master's degree, and PhD in aerospace engineering. Her research is in computational simulations of non-equilibrium flows, and in studies of gas-surface and plasma-surface interactions.

"The fluids groups in both aerospace and mechanical engineering are very interconnected," Stephani said. "A lot of the applications within mechanical engineering and many other engineering disciplines require the ability to develop high-fidelity models for solving those kinds of problems. Coming into the mechanical engineering department allows me to work with experts in plasma processing and plasma-material interactions, and my background really sets the stage for establishing collaborations in those areas. That's what I'm really hoping to accomplish here as a faculty member in MechSE."

Stephani's work with computational simulation of flow began with her undergraduate and graduate research. After the Space Shuttle Columbia disaster in 2002, boundary layer flight experiments were taking place to try to improve detection of damage to the thermal protection system. Stephani's work was focused on understanding the heating taking place due to roughness in the material, an issue relevant to the causes of the Columbia disaster.

"This was a really fascinating study, because real roughness was introduced into the thermal protection system tiles. The team was able to obtain measurements of the roughness-induced heating to the tiles in situ, so we had really great thermal IR imagery as well as heat transfer measurements deduced from thermocouple data that was taken during the reentry," Stephani said. "We had a great collaboration there. That just hooked me. And ever since then I've been really interested in developing high-fidelity models and simulation capabilities for these kinds of problems."

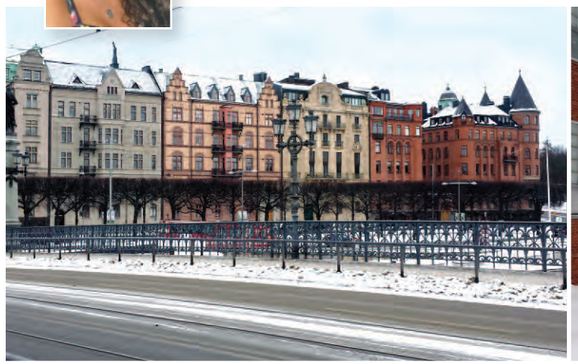
Assistant Professor Alison Dunn collaborates with Erik Reule (left) and Jino Kim in her lab in Mechanical Engineering Building.


## Students share their MechSE experiences online

Four MechSE students have been blogging on the MechSE website over the past year, giving an inside look at their experiences in the department and on their study-abroad adventures. Visit **mechse.illinois.edu/news-events/blogs** to read the latest posts or click through to each blogger's archives.

### Amanda Goes to Sweden

**Amanda Steelman**, a senior in mechanical engineering, studied abroad in Sweden in Spring 2014, thanks in part to the Nordberg INSPIRE Student Scholar Award. She shared her experiences in Sweden and other European countries with the MechSE audience through blog posts.



### Taylor-Made

**Taylor Tucker**, an undergrad in engineering mechanics, works for MechSE's communications team and blogs regularly throughout the school year, sharing her thoughts on everything from visiting lecturers to great and undiscovered spots to study around campus.

### Solo un Sol

Mechanical engineering undergrad **Paula Stocco** traveled to Uruguay in Summer 2014, collaborating with students at Universidad ORT Uruguay in design, computation, and Uruguayan culture classes. She blogged about this experience with fellow engineering women and provided great description and insight into the history and culture of Uruguay.

### Ritu's Mechanics of Motion

**Ritu Raman**, a PhD student in mechanical engineering, documented her research and travel while spending Summer 2014 at the National University of Singapore Mechanobiology Institute. She continues blogging for MechSE while she's "in motion" at conferences, retreats, and (inter)national research exchanges.



# Lofty goals

## Internship fuels student's passion for NASA

The International Space Station relies on a number of mission-critical components to keep its crew alive and well while hurtling through the hostile conditions of space, and the failure of even one life-support device on the station, if unchecked, could spell disaster.

Events came fearfully close to this catastrophe in December 2013 when an interface heat exchanger on the station's Columbus module almost froze and ruptured, a disaster that would have flooded the station with ammonia and doomed everyone on board.

Back on Earth at NASA's Mission Evaluation Room in Houston a few months later, MechSE undergrad **Madison Heimerdinger** worked on an internship in which part of her duties were aiding in an investigation into the device's close call, how NASA could prevent another incident like this from happening again, and how the crew could react in case it does happen.

"As part of the investigation, I built an integrated timeline that focused on everything happening from the day before the event happened until the heat exchanger was successfully restarted," Heimerdinger said. "I gathered information by listening to voice loops, going through console logs, and talking to people from NASA and the European Space Agency to find out what went wrong."

Ultimately, it was discovered that multiple events led to the device's near-failure. One of the main discoveries was that there was no set document that established a time limit for cold ammonia to be flowing while the device was in what's called "start-up mode," which nearly led to it leaking cold ammonia into the crew's living space.

Heimerdinger's job at NASA investigating events on the International Space Station and working in the Mission Evaluation room in Houston is the career equivalent of a holy grail for engineering students, though many of them may be surprised to learn she was actually declined a job at three separate NASA interviews before landing her internship.

"This will sound cliché, but if people want to do something, they just need to be proactive, go out and talk to people, hand out their resume, and get involved," she said. "It took me three no's before I got a yes, so just because you're rejected once doesn't mean you've lost forever."

Apart from examining evidence in the investigation, Heimerdinger worked mainly in the Mission Evaluation Room at NASA, an area behind the oft-filmed Mission Control Center, in which engineers and other staff members help coordinate NASA's missions and monitor events at their computer consoles.

Fourth time's a charm—MechSE's Madison Heimerdinger got her NASA internship after three rejections.

# 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 fellowship and scholarship recipients for 2014-15. We congratulate these students and would like to express our thanks to the alumni and friends who made these honors possible.

## MechSE Endowed Fellowships

**Eugene and Lina Abraham Fellowship**
Venkat Nemani
Matthew Piper
Andrew Schigelone

**Pat and Bette Calabrese Fellowship**
Akira Madono

**Wen Lung Chow Fellowship in Mechanical Engineering**
Xiaoyue Chen

**George A. Costello Memorial Fellowship**
Keegan Moore

**DeVor Graduate Fellowship**
Venkat Nemani
Donggyu Sohn

**Thomas J. and Virginia Fisher Dolan Fellowship**
Keegan Moore

**C. J. Gauthier Mechanical Science and Engineering Fellowship**
Katarina Struckmann

**Grayce Wicall Gauthier Fellowship**
Svjetlana Stekovic
Jonathan Wang

**George B. Grim Fellowship**
Chen Chen
Xiaoyue Chen
Peter Knapp

**Richard W. Kritzer Fellowship**
Jiahui Liang

**Henry L. Langhaar Fellowship**
Keegan Moore

**Louis J. Larson Fellowship**
Jianing Zhao

**MechSE Alumni Teaching Fellowship**
Syed Medhi
Garrett Pataky
Advitya Patyal
Rajavasanth Rajasegar

**Robert E. Miller Fellowship**
Sun Ho Lee

**James E. Peters Fellowship**
Mei Yung Wong

**Shao Lee Soo Fellowship**
Mei Yung Wong

**Stoyke Fellowship**
Brian Blankenau

**Swiegert Fellowship**
Jianing Zhao

**H.C. Ting Fellowship**
Peter Knapp
Matthew Piper
Jianing Zhao

**W. Grafton and Lillian B. Wilkins Fellowship**
Kyle Carver

## College of Engineering Fellowships

**SURGE Fellowship**
Jose Guadarrama
Hector Lopez Hernandez
Gabriela Couvertier Santos

**Roy J. Carver Fellowship in Engineering**
Amit Madhukar

## Graduate College Fellowships

**Illinois Distinguished Fellowship**
Amit Madhukar
Anna Oldani

**Clean Energy Education Fellowship**
Hyun Jin Kim

**Graduate College Distinguished Fellowship**
Gabriela Couvertier Santos

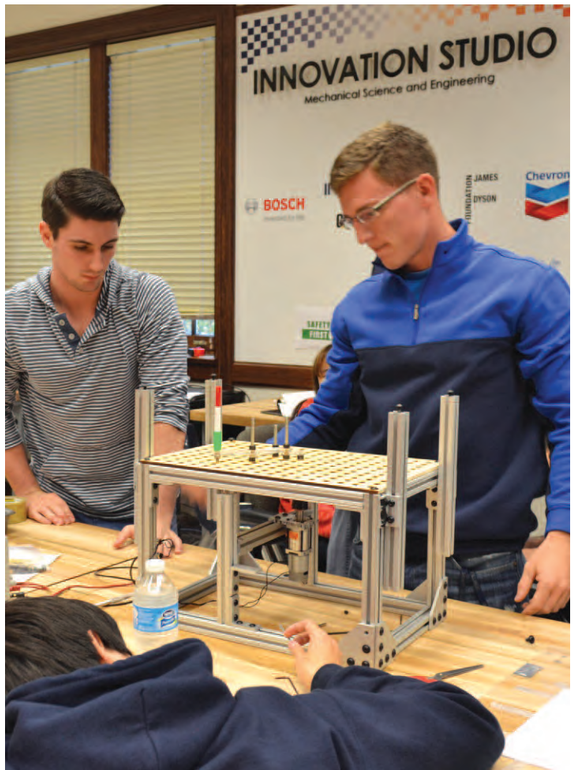
## University Fellowships

**Beckman Institute Graduate Fellowship**
Elizabeth Jones

## Corporate-Sponsored Fellowships

**FMC Technologies Fellowship**
Anish Shenoy

**Sargent and Lundy Fellowship**
Mariya Vasileva




## National Fellowships

**ASHRAE Fellowship**
Huize Li

**Department of Energy Fellowship**
Eric Mayhew
James Pikul
Matthew Rosenberger

**NSF Integrative Graduate and Research Traineeship (IGERT)**
Alan Gaglio
Willliam Wagner

**NSF Fellowship**
Stephen Hammack
Gregory Hardy
Brian McGuigan
Anna Oldani
Ritu Raman
Rishi Singh
Nicolas Tobin
Matthew Williams

**National GEM Consortium Fellowship**
Lindsey Gonzales
Charles Orozco
Mario Valdez

## International Fellowships

**Fulbright Fellowship**
Mohammed Aneeq uz Zaman

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

## MechSE Endowed Scholarships

**James W. Ashbrook Scholarship**
Bobby Baer

**A. Richard Ayers Scholarship**
Vivek Gupta

**James and Loretta Bayne Scholarship**
Dante Reese
Oscar Zavala

**Paul A. and Edna M. Beckemeyer Scholarship**
Elizabeth Jimenez

**Thomas J. Breen and Gail Schaller Breen Scholarship**
Athrey Nadhan

**Donald E. Carlson Scholarship**
Michael Pope

**Bei Tse and May Chao Scholarship**
Justin Hunter
Karen Lipa

**Guy Richard Collins Engineering Scholarship**
Timothy Chen
William Enowmbitang
Michael Hubner
Brittany Poppen
Adam Rosenbaum
Daniel Tisza
Adam Vega
Donald Witt

**Phillip A. Dethloff Scholarship**
Christopher Sanders

**Patrick B. and Janet A. Flanagan Scholarship**
Samuel Zschack

**A. G. Friederich Memorial Scholarship in Mechanical Engineering**
Jennifer Ko

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

**Margaret L. Gongaware Scholarship in Mechanical Engineering**
Michael Hafeman
Jennifer Lin
Eric Wright

**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**
Kevin Brenner
Nicholas Fazzini
Dante Reese
Stephanie Sokolyk
Charles Tierney

**Erle E. Johnson Scholarship**
Emily Weerakkody

**E. Bruce Kleber and Betty Hogan Kleber Scholarship**
Blade Parrish

**Karl W. Kolb and Arden M. Kolb-DeBolt Scholarship**
Kevin Kibler
Daniel Wong

**Charles Conrad Kritzer Scholarship**
Arturo Garcia
Shanay Thakkar
Gordon Zak

**Richard W. Kritzer Scholarship**
Nicolas John
Carly Newman
Gordon Zak

**GM/Philip W. Leistra, Jr. Scholarship**
Ekaterina Konova

**Arthur W. Lindstrom Scholarship**
Thomas McGrath
Patrick Slade

**John H. and Billie Jean Marsh Scholarship**
Prashant Guha

**James E. Peters Scholarship**
Alexander Gruebele

**Mark E. Prasse Memorial Scholarship**
Tabitha Ragon

**Ben Jay Rosenthal Scholarship**
Alex Wu

**Sam Sachs Memorial Scholarship**
Joanna Bober
Robert Born
Carl Handley

**Alwin Schaller Scholarship**
Therese Marsh
Carly Newman

**Fred B. Seely Scholarship**
Taylor Tucker

**Mark A. Shannon Scholarship**
Jerome Sacherer

**George M. and Ruth N. Sinclair Scholarship**
William Iverson

**Earl and Althea Smith Scholarship**
Grant Hallan

**Soo Family Scholarship**
Alexandra Klieger

**Morris Stern Scholarship**
Diego Gundersen

**Marvin Stippes Scholarship**
Monica Ngo

**Wilbert F. Stoecker Scholarship**
Sonja Brankovic

**Charles E. Taylor Scholarship**
Jessica Simon

**Thomas-Lain Scholarship**
Sonja Brankovic
Aakash Choubal
Grant Hallan
Brittany Poppen
Jason Troutner
Eric Wright

**James R. Tucker Scholarship**
Mason Blake
Kyle Johnston

**Raymond and Birute Viskanta Scholarship**
Peter Bruno
Daniel Gonzalez-Stewart

**William and Virginia Waterman Scholarship**
Alexander Jiskra
Alexander Lopez

**Eleanor and Eugene Wesselman Scholarship**
Christopher Marry

**W. Grafton and Lillian B. Wilkins Scholarship**
Caitlin Haisler
Jennifer Lipa
Nithin Rajkumar
Stephanie Sokolyk
Eric Staniszewski
Charles Tierney

**Steven Kyoon Yun Memorial Scholarship**
Matthew Tabrizi

## University Endowed Scholarships

**James J. and M. Joan Stukel Scholarship**
Thomas McGrath

## MechSE Annual Scholarships

**William L. Fourney Scholarship**
Bryan Hoffman
John Meyering

**MechSE Alumni Scholarship**
Sam Goldsmith
Alexander Jiskra
Jennifer Lipa
Claire Peters
Allison Rymut

**MechSE Outstanding Scholarship**
Oluwami Dosunmu-Ogunbi
Tabitha Ragon
Patrick Slade
Donald Witt

**MechSE Annual Scholarship**
Paula Stocco
Soorya Todatry
Karla Rivero Valles

## MechSE Corporate Scholarships

**Caterpillar Scholarship**
Ryan Ruddell
Albert Xiao

**ExxonMobil Scholarship**
Peter Bruno
Gail Butler
Nithin Rajkumar

**Hendrick House Scholarship**
Chetanna Nwosu
Jae Yun

**Kaiser Aluminum Scholarship**
Oluwami Dosunmu-Ogunbi
McKenzie Lavalle
Nathan Zimmerer

# Hands-on and online

## Faculty teams invigorating key courses

Decades ago, college faculty began teaming up as researchers, spurring many engineering breakthroughs that would not have otherwise occurred. More recently, an academy in the College of Engineering began encouraging faculty to form teams for teaching as well.

The goal of the Academy for Excellence in Engineering Education (AE3) is to develop high-level teaching skills throughout the College, and it offers several different programs to engineering faculty members.

MechSE professors in particular have taken advantage of AE3's Strategic Instructional Initiatives Program (SIIP), with two different faculty teams—one that teaches foundational theoretical and applied mechanics (TAM) courses and one that teaches mechanical engineering (ME) design courses—launching efforts that are helping to set a new standard for teaching excellence.

"This department has always cared about teaching and cared about its students," said Professor **Charles Tucker**, a former MechSE associate head for undergraduate programs who now serves the entire campus as vice provost for undergraduate education and innovation. In between these two appointments, he was the associate dean for undergraduate programs in the College of Engineering, where he helped launch the SIIP program. "I've been known to say that the MechSE Department teaching award is the hardest to win because the competition is tougher. There's just a great tradition of strong teaching here."

The goals of each of the two faculty teams have been to: 1. Create and implement changes to improve students' learning experience and 2. Form teams of instructors so the improvements get passed along from semester to semester. This allows for a superior

*(continued)*

In the Spring 2014 ME 370 final competition, accurate ball launching resulted in drenched faculty like Assistant Professor Sameh Tawfick (above).

Assistant Professor Elif Ertekin receives responses from her lecture class via wireless iClickers.

learning experience that can be sustained even when a new instructor takes over the course.

"I think this in-depth co-teaching and mentoring strategy is really different," said MechSE associate professor **Matt West**, the principal investigator for the TAM SIIP project. "It's been really successful in terms of bringing people up to speed on these pretty challenging classes to teach."

One major challenge is improving student engagement and enthusiasm while maintaining the current high level of rigor. To achieve this, state-of-the-art pedagogical and technological solutions are planned, implemented, and analyzed.

## TAM 211, 212, and 251

Now in its third and final year of SIIP funding, the faculty team has gotten a lot of "bang for the buck," as it instructs courses that have approximately 2,500 student enrollments each year. These are the foundational TAM courses: Introductory Statics, Introductory Dynamics, and Introductory Solid Mechanics.

"The TAM program has really been a model for other programs," said **Laura Hahn**, the director of AE3. "We are grateful for that."

In addition to West, the faculty team for the TAM courses includes **Geir Dullerud**, **Elif Ertekin**, **Randy Ewoldt**, **Blake Johnson**, **SungWoo Nam**, **Mariana Silva**, and **Dan Tortorelli**. West, Tortorelli, and Dullerud formed the original team to secure the SIIP funding, and the team has grown steadily each semester. Assistant Professor **Mariana Kersh** will join in Fall 2015.

> One of the keys to this success is "blended learning," which combines face-to-face instruction with computer-mediated learning.

"I would say in many ways the TAM SIIP team is what we hoped to see happening as we created the SIIP program," said **Geoffrey Herman**, an AE3 administrator. "From the College's perspective, the most important thing is that these changes are being sustained from semester to semester, it's growing, and there's excitement and engagement among multiple faculty to make these courses better for the students."

One of the keys to this success is "blended learning," which combines face-to-face instruction with computer-mediated learning. All of the instructional materials—including the actual lectures for the courses—are housed online, to be accessed by both instructors and students. And online discussions are continuously underway between professors, teaching assistants, and students.

"Students prefer online rather than offline material," West said. "This has largely replaced office hours. If there was one really hard question on the homework, theoretically we would have to explain it 250 times to different students. Now, one TA writes a really good explanation and posts it online. Everyone reads the same explanation, and then there is some back-and-forth discussion. It really works great."

With students digesting the bulk of the course material on their own time, classroom time is freed up for much more interactive learning than in previous years. During lectures, students use handheld iClickers to create an active learning environment. The remote control-like devices allow students to choose answers to multiple-choice questions raised by the instructors, thus enabling instructors to monitor immediately which subject matter has been understood well and which needs to be given more attention.

West noted that attendance in the large lecture courses has greatly increased because students find the classes more engaging.

"There is more interaction within lecture and in discussion sections," West said. "It's sort of this paradoxical thing, where you think if you go online, it's going to reduce personal interaction, but actually you get more of it because you are not spending all this time sitting there, copying notes off the black board. I think it's logical that when you get better interaction online you have all this time to argue with each other and have in-depth discussions offline."

The discussion sections, which each contain about 20 students, were realigned so that the students now form four-person groups to work on assignments instead of working individually. While not all students favor this method at the start of the semester, by mid-semester an overwhelming majority of students say they see the value of the groups and would not want to go back to working alone.

## ME 370 and 371

At the opposite end of the teaching spectrum from the large lectures of the foundational TAM courses, ME 370 and 371 are very hands-on mechanical design courses.

The faculty team consists of Principal Investigator **Steve Downing,** working with **Elizabeth Hsiao-Wecksler** and **Sameh Tawfick**.

This team has also "flipped" its instruction by providing the lecture material for students to watch on video on their own time. But, instead of freeing up class time for interactive classroom learning, they are providing the maximum amount of time for students to be doing hands-on design work.

> "Students have told me that this is the class where they have learned the most since they got here."

"Our students are better prepared to design things after these two classes than was the situation five years ago," said Downing, who has incorporated hands-on design in ME 371 for years. The SIIP grant has allowed him and the other faculty to formalize the structure of the courses and attract other instructors to join the team and sustain the improvements.

In the main ME 370 project for Fall 2013, four-student teams designed and created machines to shoot or throw darts at a target. Teams with the best machines went head-to-head in a final competition in the open commons area in Mechanical Engineering Laboratory.

In Spring 2014, each student team was tasked with completing two projects: writing a proposal for a "Drench Your Professor" booth, and designing and building BLAMs (Ball-LAunching Mechanisms). The two projects came together for a final competition, as the top teams faced off on the Bardeen Quad launching plastic balls at a target—a narrow tube. If the ball was on line and entered the tube, it activated the booth, and one of the course instructors got drenched inside the booth.

"Students have told me that this is the class where they have learned the most since they got here," Tawfick said. "After taking this class, they really feel like they are becoming mechanical engineers."

How much weight can your machine lift in 60 seconds? It had better be a lot if you want an A in ME 371.

# Continental sabbatical

## MechSE professors (and spouses) receive grants to research overseas

"Parlez-vous anglais?"

It's likely this phrase was heard often from members of the Johnson family in July 2014 as they settled into their new life in Grenoble, France.

Associate Professor **Amy Wagoner Johnson** and her husband, Professor and Kritzer Faculty Scholar **Harley Johnson**, are continuing each of their research efforts while also enjoying the cultural benefits of living in France for 13 months.

"The kids are learning French nicely and settling into French culture, such as never going a day without a fresh baguette!" Wagoner Johnson said. "I am also brushing up on my French and am even going to give a seminar in French in April."

Wagoner Johnson was selected as a Chair of Excellence by the NanoSciences Foundation in Grenoble. The Foundation fosters nanoscience research in their 33 networked laboratories by encouraging multidisciplinary projects among talented international researchers, providing the space and resources to collaborate with each other.

She primarily has been collaborating with her host researcher in Grenoble, Professor **Catherine Picart**, of the Grenoble Institute of Technology, although the project involves researchers from three other laboratories. The objective of their project is to engineer novel 3D microenvironments to better understand cell-cell and cell-material interactions and to enhance cell differentiation and tissue formation, particularly in bone tissue.

Johnson, meanwhile, has received a Fulbright grant for 2014-15 as part of his sabbatical in France. Formally known as the Fulbright U.S. Scholar Research Award, the grant is presented to select scholars and professionals to do research around the world.

Additionally, Johnson's work in France is supported by an invited professorship at the Université de Grenoble. The funding is enabling Johnson to execute his research on materials for photovoltaics at CEA (the French national energy lab) and with a research group at Grenoble-INP (the engineering school or grand école that is part of Université de Grenoble).

"At the university I'm working on applying a theoretical method to predict the macroscopic patterns of defects that form during processing of a silicon solar cell wafer," Johnson said. "With my colleagues at the national lab, we're studying the optical effects—usually bad—that just one such defect can have on the performance of the solar cell."

Moving the family to France was a big transition, but both professors are grateful for the chance to collaborate in new ways. In a way, Wagoner Johnson said, their family is repeating history.

"My father took a sabbatical in France when I was a junior in high school, so I lived there for a year. I am excited to have this opportunity with my own family on sabbatical now, twenty-some years later."



# Faculty Updates

**Andrew Alleyne** was awarded the Henry M. Paynter Outstanding Investigator Award by ASME. This award is given biennially by ASME to a Dynamic Systems and Control Division member who has demonstrated sustained outstanding research contributions, either basic or applied, as a mechanical engineering professional to fields of interest to the DSCD. He also won the University's Larine Y. Cowan "Make a Difference" Award for Teaching and Mentoring in Diversity, 2014.

**Narayana Aluru** authored an article published in *ACS Nano* for his work on gene-based personalized medicine. His group has found that nanopores in the material molybdenum disulfide ($MoS_2$) could sequence DNA more accurately, quickly, and inexpensively than anything yet available.

**Harry Dankowicz** received a research grant from the U.S. Department of Agriculture, National Institute of Food and Agriculture for the design of adaptive control strategies for cooperative human-robot networks in agricultural applications. In June 2014, Dankowicz gave the opening plenary keynote at the quadrennial U.S. National Congress on Theoretical and Applied Mechanics.

**Placid Ferreira** has been named a Fellow of the American Association for the Advancement of Science (AAAS). This honor is bestowed upon AAAS members by their peers because of their scientifically or socially distinguished efforts to advance science. Ferreira was honored specifically for distinguished contributions in areas of manufacturing research, including precision engineering and machine tools, nanoscale manufacturing and flexible automation, and for excellence in leadership.

**Jonathan Freund** has been named associate editor of the *Physics of Fluids* journal. He has also begun an appointment on the editorial board of the *Annual Review of Fluid Mechanics.*

**Sascha Hilgenfeldt** authored an article that was selected for publication in the IOPselect collection of journal articles. "Lewis' law revisited: The role of anisotropy in size-topology correlations" was originally published in the IOP publication *The New Journal of Physics* in January 2014.

**Naira Hovakimyan** was honored with the prestigious Alexander von Humboldt Research Award, also known as the Humboldt Prize. This highly competitive German award is granted to outstanding international researchers for their scientific achievements with the prospect of more cutting-edge discoveries in their academic career. Her students' work was listed among the year's five best drone movies of 2014 by ArtSlant.

**Elizabeth Hsiao-Wecksler** was named an ASME Fellow, the group's highest membership grade of distinction. The ASME Board of Governors confers the Fellow grade of membership on worthy candidates to recognize their outstanding engineering achievements.

**Shiv Kapoor** was awarded the 2015 SME Gold Medal, a prestigious international honor award presented annually by SME. He is recognized for outstanding service to the manufacturing engineering profession in technical communications through published literature, technical writings, and lectures.

**William King** was named the Ralph A. Andersen Endowed Chair in the Department of Mechanical Science and Engineering. He was also named a Fellow of the American Physical Society, an honor bestowed to no more than one half of one percent of the society's membership.

**Seid Koric** received three awards at the 2014 HPCwire Readers' and Editors' Choice Awards. His work was chosen as the readers' choice for Top Supercomputing Achievement, and as both the readers' and editors' choice for Best Use of High Performance Computing Application in Manufacturing.

**SungWoo Nam** authored an article that was published in *Nano Letters*. He is leading a team of engineers in using Shrinky Dinks, plastic that shrinks under high heat, to close the gap between nanowires in an array to make them useful for high-performance electronics applications.

**Martin Ostoja-Starzewski** had a paper published in the Royal Society journal *Proceedings of the Royal Society A*. As the national academy of science in the United Kingdom, the Royal Society is a fellowship of the world's most eminent scientists and is the oldest scientific academy in continuous existence. He also gave four invited lectures at the International Symposium on Modern Mathematics and Mechanics.

**Arne Pearlstein** was named a Fellow of the American Physical Society, an honor bestowed to no more than one half of one percent of the society's membership. Pearlstein has been a member of APS since 1976.

**Sanjiv Sinha** was promoted to associate professor. He joined the MechSE Department as an assistant professor in 2008 after receiving his PhD in mechanical engineering from Stanford in 2005.

**Kimani Toussaint** was published in *Nature Communications* for his work developing novel, metal, pillar-bowtie nanoantenna (p-BNA) array template on 500-nanometer tall silicon dioxide (glass) pillars.

**Ning Wang** was invested as the Leonard C. and Mary Lou Hoeft Professor in the College of Engineering.

# Engineering the perfect brew

## MechSE alumnus opens microbrewery in Chicagoland

In early 2014, **Tom Korder** (BSME '05) joined the long list of entrepreneurs among MechSE alumni when he opened Penrose Brewing Company in Geneva, Illinois.

As might be expected of a brewery owner/operator, Korder had not taken a typical career path after graduation. Not only did he eschew the pursuit of more prototypical mechanical engineering jobs to learn to brew beer professionally, but he started at the industry's giant corporation.

"I went in a different direction than most people," Korder said. "Most people start home brewing and really get into it; I started professionally at the largest brewer in the world, Anheuser-Busch, and worked for them as a manager."

He had discovered this opportunity through a career fair and took his first position with very little knowledge of brewing. He gained it quickly.

"I learned all about beer and I got a very scientific look at how to make consistent beer, time after time," Korder said. "From there, I went to one of their bigger breweries in Georgia, and I decided it was getting a little too big and 'factory' for me. I wanted to go to a craft brewer and really make my mark."

Soon he joined Goose Island in Chicago, bringing him closer to home—Urbana—and to the type of work in which he felt the strongest passion—finely crafted beer. He served as brewery manager and handled schedules, projects, installations within circuits, and beer oversight. He managed brewers, helped ideas for recipes become reality, and ensured that ideas for new beers coincided with the Goose Island brand.

But Korder found that while he was partaking in creating new beers, he was limited in terms of the style and flavor of beverages he could produce.

"If the sales department doesn't think it can sell, it doesn't hit the market," Korder said. "If it doesn't fit with a certain brand family that's not very marketing-driven, it gets detached."

Starting a new brewery on his own was a recurring thought, but the missing ingredient was the ability to establish a strong sales network for distribution of the product. Fortunately, he had come to know Goose Island sales representative **Eric Hobbs**, who had similar entrepreneurial ideas.

Having such a strong team—proven production and sales from Goose Island—undoubtedly went a long way toward securing their financial backing. After several months of dedicated business planning, investors came on board. Korder and Hobbs left Goose Island in early 2013, spent the rest of the year assembling their substantial brewing operation in Geneva, and bottled the first Penrose Brewing Company products in early 2014.

"We hit the ground running," Korder said. "We wanted to be a decent size brewery. We planned a little bit bigger, which took a little bit longer to build up to, but that's the end game—we want people to be able to buy our beer."

"Brewing is a very scientific field. When you get down to it, it's biology, it's chemistry, it's yeast metabolism. I think that's really what mechanical engineering prepared me for."

The company's first two offerings were named Proto Gradus (a Belgian-inspired single ale) and P-2 (a Belgian-inspired pale ale). After those were well received by distributors, Penrose followed up with four more: Devoir (a saison ale), Desirous (a white IPA), Navette (a Belgian-inspired black ale), and Fractal (a Belgian IPA).

Now, counting limited releases and seasonals along with their standard offerings, the company has already created more than 50 beers. The selections range from stouts to flavorful options such as blackberry saison and honey ale.

"We use a lot of different yeast strains to produce fruity characters, or spicy aromas, or acidity," Korder said. "We think it's important to pack a lot of character into all of our beer."

Most of the Penrose brews are set apart competitively by containing only four to six percent alcohol by volume.

"Everyone in this world is going bigger, bigger, bigger," Korder said about the alcohol content in current craft beer offerings. "Sometimes you see a tap list that doesn't have anything under seven percent. We focus a lot on lower-alcohol beers."

Penrose Brewing Company products can be found in all eight counties in Chicagoland, Korder said. Large retail outlets like Binny's Beverage Depot stores will soon carry several of Penrose's beverages. And many of Chicago's most popular bars, including The Bad Apple in North Center and Hopleaf in Uptown, already have some of the brewery's selections on tap.

Korder is riding the wave of momentum that began when he and Hobbs first brainstormed the idea of striking out on their own. When he was an undergrad in MechSE, he had no idea that he would end up running a brewery, as it's not a typical path for a mechanical engineer. But he said the education he received here has been valuable each step along the way.

"It all comes down to learning how to figure things out—process solving," Korder said. "I didn't learn anything about brewing beer in mechanical engineering, but mechanical engineering taught me to be able to learn about the brewing, to learn about the process, to learn and always move forward.

"Brewing is a very scientific field. When you get down to it, it's biology, it's chemistry, it's yeast metabolism. I think that's really what mechanical engineering prepared me for."

### From Zagat's "5 Must-Try Suburban Breweries"

**PENROSE BREWING COMPANY**

The most beautiful brewery and taproom on our crawl is located on a nondescript street just outside of downtown Geneva. The new facility is already making waves on the Chicago beer scene for its saison-centric lineup, which is served in the bright taproom. Named after the geometric tile pattern, a tribute to both art and science, the taproom shows off the brewery's eye for design with white walls painted with black and red diagrams of the brewing process. Again, flights are the best option here, served in custom wood and metal pipe carriers. Each flight consists of four beers, ranging from the flagship P-2 and Proto Gratus to limited-release Belgian IPA and dry-hopped saison. For the best seat, belly up to the 12-seat bar with a glass window that offers a peek into the brewhouse.

**DRINK THIS:** Devoir, Belgian-inspired saison.

**INSIDER TIP:** Keep an eye out for the new Day Beer series of beers brewed with different yeast strains that are only served in the taproom.


"A musical of raw power with superb, intense performances."
–Variety

# HOW SWEET THE SOUND

## MechSE alumnus goes beyond engineering to produce a new pre-Broadway musical

**Alexander Rankin** (BSME '57)—an alumnus whose range of professional endeavors has included engineering, banking, and software, to name a few—has recently been applying his entrepreneurial skills in another unexpected way: producing a critically acclaimed musical on stage in Chicago.

"Amazing Grace" tells the true story of how Englishman John Newton (1725-1807) came to write one of the most well-known and beloved songs while rebelling against his upbringing amid the slave trade. The musical, which ran October 9 through November 2, 2014 at the Bank of America Theatre, was picked up by Rankin after the playwright and an initial group of investors made several attempts to get the project off the ground.

"I tried to get people to invest in it with me, and they said, 'First of all, what do you know about musicals?' Obviously, nothing!" Rankin said. "But I know how to hire the right people who know about musicals. I just knew the show had huge possibilities."

He used his engineering and business expertise to quickly grow the musical into a successful production with Tony Award-nominated performers and noteworthy producers.

"If you're going to do something like this, you do it with the best. You don't try to cut corners or cost."

Rankin's generous financing, along with his ability to lead and manage, helped carry the production from the small Goodspeed Theatre in Connecticut to a pre-Broadway stage in Chicago, with the ultimate goal of bringing it to a Broadway theatre in New York.

His intuition and perseverance paid off, and the show received strong critical reviews. The *Chicago Sun-Times* wrote that it was "artfully produced on the lavish scale of Les Mis. A stirring musical. An epic romance."

"It was a very powerful show, and every performance ended up with a spontaneous standing ovation," Rankin said.

In 1967, just 10 years after earning his mechanical engineering degree from Illinois, Rankin started Vulcan Spring and Manufacturing Co., running one spring coiling machine from his basement. The company's first commercial application was a spring used to drive the speech mechanism of the "Talking G.I. Joe" action figure. Rankin has since turned over the company to his son, and it now occupies a 55,000-square-foot building. Today, Vulcan products are used in applications ranging from surgical tools and appliances to locomotives and satellites.

In 1998, Rankin honored his machine design professor by endowing the James W. Bayne Professorship. In 2003, he established the Alexander Rankin Professorship in honor of the men after whom he was named: his father, grandfather, great-grandfather, and great-great-grandfather. And in 2011, Rankin was inducted into the College of Engineering Hall of Fame.

# Alumni in Memoriam

**1936**
Lester T. Sharp, 07/03/2013

**1940**
Frank W. Houck, 09/24/2013

**1942**
Gordon D. Chambliss, 02/23/2014
Robert H. Lodge, 01/06/2014
Robert D. Teece, Sr., 04/16/2014

**1943**
Dale L. Hankins, 09/13/2013
George M. Long, 02/20/2014

**1944**
Karl H. Schafer, 09/22/2013

**1946**
Norman L. Cochran, 03/23/2014
Harry Pedersen, 08/16/2013
Hall C. Roland, 05/03/2014

**1947**
Robert M. Gillis, 03/25/2014
James W. Huff, 04/28/2014
Bernard R. Kasik, 10/04/2013
John M. Lundin, 11/21/2013
Steve Lynn, 11/13/2013

**1948**
Eugene P. Barta, 02/07/2014
John C. Klopp, 05/11/2014
John O. Roeser, 06/13/2014
Robert M. Sanford, 11/27/2013
John T. Skinner, 06/14/2014

**1949**
Lewis J. Craft, Jr., 12/23/2013
Farough Farman-Farmaian, 03/15/2014
Vernon A. Jackson, 01/26/2014
Louis M. Stuebe, 12/3/2013
Harley L. Teel, 10/06/2013
Henry C. Tonigan, 04/01/2014

**1950**
Richard L. Arnicar, 04/03/2014
James S. Brown, 11/22/2013
Phillip B. Doll, 02/14/2014
Robert W. Giertz, 07/14/2013
Robert E. Gluck, 07/02/2013
John P. Lichter, Jr., 12/28/2013
Edward N. Miner, 12/21/2013
Charles A. Stocks, 06/30/2014

**1951**
Jean R. Fortier, 10/30/2013
Gustav O. Handegord, 03/19/2014
Walter P. Hansen, 03/16/2014
William F. Herdrich, 11/25/2013
Marvin C. Tyler, 11/01/2013
Donald D. Weidhuner, 07/22/2013

**1952**
John R. Folkrod, 04/09/2014
Russell W. Karry, 06/30/2014
Kenneth F. Welter, 09/01/2013

**1953**
Wen L. Chow, 09/20/2013

**1954**
Richard K. Brown, 01/13/2014
George B. Gurney, 03/12/2014

**1955**
Irwin C. Alter, 07/02/2013
H. Maurice Borror, 04/24/2014
Thomas F. Regul, 10/21/2013
Albert B. Taylor, Jr., 08/31/2013

**1956**
Roland E. Clement, 09/23/2013
Elmer L. Collins, 03/11/2014
Norman H. Davison, Jr., 08/06/2013
Harry J. Dawson, 05/01/2014
Harvey R. Fraser, Sr., 11/10/2013

**1957**
William R. Heyduck, 11/05/2013
Theodore W. Miller, Jr., 05/17/2014
David E. North, 10/17/2013
Neil W. Perington, 12/27/2013

**1958**
Harold W. Auter, 05/04/2014
Raymond B. Ruff, 07/28/2013
Robert R. Williams, 01/18/2014

**1959**
Donald R. Kuehl, 10/31/2014
Philip E. Lambdin, 06/07/2014
Robert F. Ray, 12/17/2013

**1960**
Peter P. Philhower, 11/18/2013

**1962**
Theodore S. Besh, Jr., 01/31/2014
Milton J. Profant, 06/30/2014
Robert G. Valpey, 04/12/2014

**1963**
Richard E. Toth, 05/14/2014

**1964**
John M. Gramza, 04/22/2014

**1965**
Robert F. Bowen, 06/17/2014

**1966**
Michael J. Freilinger, 03/02/2014

**1967**
David G. Belanger, 09/30/2013
Preston O. Robards, Jr., 03/15/2014

**1969**
Kenneth M. Kroupa, 12/05/2013

**1970**
James R. Broch, 01/09/2014

**1971**
Fenton A. Bain, 07/06/2013

**1973**
John R. Huizenga, 01/12/2014

**1976**
Andres Calderon-Colon, 11/09/2013
Jan R. Jerabek, 04/10/2014

**1979**
Patrick J. Coyle, 01/08/2014

**1981**
Keith T. Wellman, 06/20/2014

**1983**
Kenrick J. Johnson, 02/02/2014

**1984**
Robin K. Smithson, 06/30/2014

**1985**
Scott W. Jacobs, 06/30/2014

**1987**
Jeffrey L. Slunder, 11/04/2013

**1989**
Thomas J. Curran, 02/11/2014

## In Memoriam: alumnus and faculty member

**Herbert T. Corten** (MSTAM '47) died September 10, 2014, at his home in Urbana. He was 88. Born in Oak Park, Illinois and raised in Maywood, Illinois, Corten received a BS degree in mechanical engineering from the Illinois Institute of Technology and an MS degree in Theoretical and Applied Mechanics from the University of Illinois at Urbana-Champaign. After serving as an instructor in engineering mechanics at Wayne State University, he returned to UIUC's TAM Department and became an assistant professor (1951-52), research assistant professor (1952-55), research associate professor (1955-57), associate professor (1957-58), and professor (1958-90). He retired in 1990 and remained active in ASME and other groups. During his academic career, he studied fatigue, fracture mechanics, and composites. His fracture mechanics research led to him consulting for the Advisory Committee on Reactor Safeguards of the Nuclear Regulatory Commission and for numerous companies. He also served as associate director of the National Center for Composite Materials Research at UIUC from its founding in 1986 until 1989.



# Alumni Board

## New alumni board members

New member Marina Tharayil is welcomed by alumni board president Eric Brown (BSME '98, MSTAM '01, PhDTAM '03) (left) and vice president Tom Donovan (BSME '82).

**Krishna Jonnalagadda** (PhDTAM '97), general manager of lifecycle growth for CF6/GEnx product lines at GE Aviation

**Zach Kaplan** (BSME '01), founder and CEO of Inventables, the hardware store for designers

**Michael R. Kessler** (MSTAM '98, PhDTAM '02), Berry Family Director and professor of the School of Mechanical and Materials Engineering at Washington State University

**Tom McCarthy** (BSME '87, MSME '89), chief engineer for powertrain research and advanced engineering at Ford

**Susan Shimoyama** (BSME '84), vice president of global sales and marketing operations at Rockwell Automation

**Marina Tharayil** (MSME '01, PhDME '05), research competency manager for the Systems Design and Controls area at PARC, a Xerox company

**Mark Woodmansee** (BSME '94, MSME '97, PhDME '99), technical director for Artificial Lift business for Halliburton Energy Services

**Rong Zhang** (PhDME '02), R&D leader of crop harvesters in China and India for John Deere

## From the MechSE Alumni Board

It has been a great pleasure to work with Professor **Placid Ferreira** during his five-plus years as Head of the Department of Mechanical Science and Engineering. The board thanks him for his service to the department and wishes him well as he returns to the faculty full time.

During Placid's tenure as Department Head, we have seen an increased inclusion of the board in department strategy and the desire to build a strong alumni network with board members. Despite facing ever-decreasing state funding, the department has grown in its breadth and depth, bringing in several new faculty and a larger student population. All of the degree programs in Engineering Mechanics, Mechanical Engineering, and Theoretical and Applied Mechanics remain robust and continue to move up in national rankings. And under Placid's leadership, both the MechSE faculty and the board have advanced diversity in composition.

In connection with the board, we would like to highlight two legacies of Placid's tenure in collaboration between the board and the department. We have launched the MechSE Visionary Scholarship Fund, which we would like to encourage all alumni to support. We have also introduced the new Outstanding Young Alumni Award to complement our MechSE Distinguished Alumni Award. Please nominate your early-career colleagues for this recognition. On behalf of the MechSE Alumni Board, we wish to thank Professor Placid Ferreira for his leadership and vision in advancing MechSE at the University of Illinois!

Very truly yours,
**The Alumni Board of the Department of Mechanical Science and Engineering**

If you are interested in contributing to the **MechSE Visionary Scholarship Fund** or supporting the department in another way, please visit the following website for more information: mechse.illinois.edu/donate.

Please submit nominations for the **Outstanding Young Alumni Award** via email to mechse-advancement@illinois.edu by February 20, 2015.


Jonnalagadda


Kaplan


Kessler


McCarthy


Shimoyama


Tharayil


Woodmansee


Zhang

# Donors

*July 1, 2013 – June 30, 2014*

*The spirit 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.*

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Hermia G. Soo

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Bruce Kleber Estate

**1960s**
William and Virginia Waterman Estate

**1970s**
Edward M. Caulfield

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**Alumni:**
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A. Duane and Carol L. Tonelli
Raymond Viskanta

**1960s**
William L. Fourney
Donald R. Sittner

**1980s**
Hugh A. and Lisa L. Abrams

## $5,000–$9,999

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**1960s**
Richard and Marilee Davies
Jack Bailey and Cheryl Wassmundt Esmond
Emerson W. and Martha L. Lacey

**1970s**
Thomas J. and Gail S. Breen
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**1980s**
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**1990s**
Clifford E. and Kathleen Miller

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James K. and Karen G. Trigger
Gary Wiesehahn

**Alumni:**
**1940s**
Charles A. Sweningsen

**1950s**
Charles A. Gautschy, Jr.
Robert Earl Miller

**1960s**
Robert Roy Awe
G. Thomas and Joan D. Castino
William R. and Susan C. Winn

**1970s**
Michael R. and Kathleen M. Mitchell
Michael J. Molitor
R. Todd Swinderman
Jeffrey P. Wang
Norman R. and Kathleen M. Warpinski

**1980s**
Patrick M. McAuliffe
Ronald C. Schneider

**1990s**
Katherine S. Lin

**2000s**
Dale M. Sormaz
Jack D. Sormaz

## $1,000–$1,999

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Marianne and Andrew G. Alleyne
Phyllis W. Hallene
Melvin Kupperman
Michael Moore
John D. Stuart
Margaret K. Wolf

**Alumni:**
**1940s**
John T. Fisher
George Roger Oehmke

**1950s**
David L. Day
Burzoe K. and Nancy Ghandhi
Gerald E. McGinnis
George R. Powers
Ellis A. Schmidt
William H. Smith, Jr.

**1960s**
Ed and Dev Kiedaisch
James E. Pettegrew, Jr. and Clara S. Pettegrew
Phillip W. Thiessen

**1970s**
Brian W. and Deborah Wiley Beaird
Walter L. Earley
Jan Paul Favero
Richard E. Furkert
Michael E. and Catherine P. Heidenreich
James C. and Connie Hickman
Stephen and Jerri Donna Plesh
Peter L. Vallandigham

**1980s**
Edwin S. Chim
Robert E. and Celeste M. Coverdill
John R. Ewan
Kathryn N. and Grant Frost
Joseph M. Powers
Lonnie Sharpe, Jr.
Michael T. Sullivan
John S. Wilson, Jr.
Jamal S. Yagoobi

**1990s**
Xinsheng Zhu and Lihua Zhou

**2000s**
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Eric N. Brown
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## $1–$999

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Matthew Hopcroft
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John Bradley Hull
Natalie-Rose L. Jenkins
Thomas Johnson
Chaman N. Kashkari
Gerald E. and Christine A. Kolar
Richard H. Korst
Rudy K. Korst
Allen G. Markson
Gary R. Mileski
Fredric G. Nearing
Richard Nechtow
Elizabeth Ann Voss Neilson
Vern H. and Mary Ostrow
Robert L. and Jane Allen Peddicord
Dorothy A. Penrose
Maynard A. and Mona C. Plamondon
Rick C. Powell
Earl and Marcia Prasse
Mary Jane Pugeda
Geoffrey K. Reiss and Anna V. Walker
Robert C. and Joanne Ryan
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Michael P. and Alyssa A. Voightmann
James E. Wheeler and Judy M. Wheeler
Yan Wu and Zhiqiang Ma
David C. and Michelle M. Yeh
Lisa I-Ching Yeh
Richard C. and Corina Yeh
George T. and Priscilla C. Yu
James W. and Sharon W. Zalesky
Yisheng Zhang
Likun Zhu

**Alumni:**
**1940s**
Lester H. Beck
Clarence M. McClymonds
Wayne A. Ring
Robert M. and Jean C. Sanford
Jacob E. and Shirley M. Staab

**1950s**
Naim Z. Azer
Herbert S. Bistritz
E. J. Blunt
David Lee and Barbara Sue Carlson
Leonard J. Carlson
Kenneth R. Carroll
James O. and Joretta A. Chambers
Marcus B. Crotts
Cecil V. Dean
Donald C. Dowdall
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James D. and Carol Eaton
Marvin W. and Barbara A. Ehlers
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Thomas C. Goad
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Harold J. Sinder
Veto J. Straznickas
Charles J. and Sondra S. Travers
Clair C. Trefz
James W. Voth
Roger K. Wadsworth
Albert A. Zagotta

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E. C. Blomeyer
Melferd A. and Janet R. Bose
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Larry E. and Jo Ellen Campbell
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Archie M. and Judy F. Doering
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Charles R. Cooper
Marlin D. Crown
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Kenneth J. Detmer
Alan S. Duncanson
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Kevin M. Flannery
John S. and Darlene K. Ford
N. Allen Gammon
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Alan M. Hallene, Jr.
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Mehrdad Hojati
Min-Nan and Pi-Yu Huang
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D. Brad and Theresa M. Keleher
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Ping-Ho Tsai
Daniel J. Weinacht
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Christopher M. Schuman
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*July 1, 2013 – June 30, 2014*

*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. Such gifts include matching gift funds made in connection with donations from employees, typically alumni. We are proud to acknowledge the organizations here, which have supported MechSE programs over the past year.*

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**Parker-Hannifin**
On August 18, 2014, Parker-Hannifin representatives opened a newly donated laboratory in Mechanical Engineering Laboratory. It will be mainly utilized by students, staff, and faculty involved with the Air Conditioning and Refrigeration Center, one of MechSE's large research groups. "In order for our work to truly have an impact, we must constantly engage with industry. This new Parker-Hannifin lab is a wonderful opportunity for us to accomplish this," said Dr. Martin Wong, executive associate dean in the College of Engineering.

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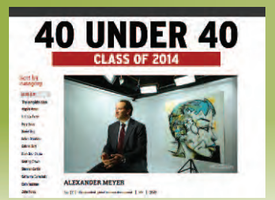


# Crain's Chicago Business

## Two MechSE alums make "40 Under 40" list

We are proud to share that two MechSE alumni—Zach Kaplan (BSME '01) and Alexander Meyer (BSME '99)—were included in the 2014 class of "40 Under 40" in *Crain's Chicago Business*. The publication states these are "the executives, entrepreneurs, creatives, and politicos who will be running the city someday."

### Zach Kaplan

**Age: 35 | CEO | Inventables | @zkaplan**

"The idea that you can make things at home instead of buying things off the rack is something he feels is happening," says the founder of Rackspace U.S., a cloud-based hosting company. **Zach Kaplan** is sure we're in the early stages of a third industrial revolution. There's even a term for it—the "maker movement"—that's seeping into the national dialogue. "I believe it's going to be the largest source of net new job growth in the next two decades," says the Northbrook native, spinning in his chair at the West Loop headquarters of his 12-year-old e-commerce company, Inventables.

An online hardware store that sells 3-D printers, laser cutters, and the like to designers and tinkerers, the company has grown exponentially thanks to cheaper technology and the rise of the DIY culture. In three years, Inventables has nearly tripled in size: Its customer base has rocketed to 27,000 from 4,000, and Kaplan now employs 30. In 2013, he raised $3 million from Draper Associates and other investors. "This idea that you can make things at home instead of buying things off the rack is something he feels is happening," says Richard Yoo, founder of Rackspace U.S., a cloud-based hosting company. "He shares it with whoever he can."

Last year, Inventables designed the city's first free "maker space" on the third floor of the Loop's Harold Washington Library. The pop-up fabrication lab is so popular, it still is outliving its scheduled closing date of December 2013. Then, this past June, Kaplan's career hit a new high when he was invited to be President Barack Obama's guest at the White House's Maker Faire. So he jettisoned his customary jeans for a suit and helped kick off the country's inaugural National Day of Making.

#### Bonus Points

**Up next:** Building buzz around his newest product launch, 3-D carving machine Carvey.
**Motto:** "Fail often to succeed sooner."
**How I unwind:** "Watch 'The Daily Show.'"

### Alexander Meyer

**Age: 37 | Vice president, global business development | SAP | @SAP**

It's a good thing **Alexander Meyer** likes to travel. He spends much of his time flying to Rwanda, Tunisia, Morocco, and other far-flung places drumming up business for software giant SAP. The think-on-his-feet job, which Meyer created, blends his varied skills and international background.

Born in Azerbaijan, he moved to Rogers Park when he was 3. After graduating from the University of Illinois at Urbana-Champaign, where he studied engineering, he backpacked around Europe before getting an MBA at Harvard University. Since then, he has launched a Chicago chapter of Harvard Business School Alumni Angels, as well as an HBS Alumni New Venture business-plan competition that has expanded to 15 cities.

Meyer always has been able to work a crowd, a talent he honed in classes at Second City. "I've always been a clown," he says. And while he never seriously considered leaving consulting for acting, in 2009 he helped launch Stage 773, a theater in Lakeview, at the worst point of the recession. "Alex is the guy behind the curtain," says artistic director Brian Posen, who taught Meyer improv. "No way would we have been here without him."

#### Bonus Points

**Up next:** Launching an acting school at Stage 773.
**Places that make me happy I'm a Chicagoan:** "The Green Mill and Second City."
**How I unwind:** "See live music and theater whenever I can."

*Photos and text courtesy of Crain's Chicago Business.*



# Message from the Advancement Office: A Vision of the Future

In November I had the wonderful opportunity to host eight recent MechSE alumni—who are all currently mechanical engineering graduate students at Stanford—for dinner in Palo Alto, CA. I was very happy to hear that they all felt their undergraduate education at Illinois had prepared them well for graduate coursework at Stanford.

They were all eager to hear news from MechSE and were very excited to learn of the Engineering Visionary Scholarship Initiative, the opening of the Innovation Studio, and that plans for the Mechanical Engineering Building renovation and addition were proceeding. I spoke to them about giving back, even though they are obviously young alumni and don't have jobs and extra income at this point. Much to my delight, I learned that several of them have already started giving, and the rest indicated that they hope to do so very soon! They understand the importance of supporting MechSE, and especially the annual fund, which provides funding for student programs.

We are very pleased with the great attitude of our young alumni, spurred by the culture that is developing within our department—that of current students already thinking of themselves as alumni. Many new activities are underway as a result of our MechSE Advancement Student Committee, which is comprised solely of current students.

I ask you to consider joining these young alumni in making an annual gift to MechSE—there are many options available on the giving page at our website (**mechse.illinois.edu/giving**). Every gift is appreciated, and each one has an impact, regardless of the size.

Best wishes to all of you for a healthy, happy, and prosperous 2015.

Robert E. Coverdill
Director of Advancement and Outreach Activities
coverdil@illinois.edu
217-333-4109

### Connect with MechSE

We encourage all alumni and friends to stay connected with the Department of Mechanical Science and Engineering! There are many ways to get involved and share your time, talent, or treasure with the department. Here are some examples:

- Give a gift
- Recruit our students
- Serve as an alumni speaker
- Attend an alumni event
- Update us
- Visit us when you are back on campus for Homecoming, Engineering Open House, or any other event
- Organize a field trip for students to your company
- Sponsor a Senior Design project

If you are interested in learning more about these opportunities or other ways to stay connected, please contact **Betsy Powers**, Assistant Director of Advancement, via email at epowers2@illinois.edu or by phone at (217) 333-9713.


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

If you have a smart phone, you can access this page by scanning the accompanying QR code.

*QR code reader app must be used to scan this code.*

### 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**. If you have a smart phone, you can access this page by scanning the accompanying QR code.

### Attention, entrepreneurs!

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

**Join our social networks—just go to mechse.illinois.edu!**

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**Cold and blustery weather lasted far too long into the Spring 2014 semester. Students, faculty, and staff are all hoping for an early thaw in Spring 2015!**