

Mechanical

SCIENCE AND ENGINEERING



Moving the World Forward



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Mechanical Science and Engineering

Department Head
Placid Ferreira

Director of Advancement
Bob Coverdill

Editor
Bill Bowman
wbowman@illinois.edu

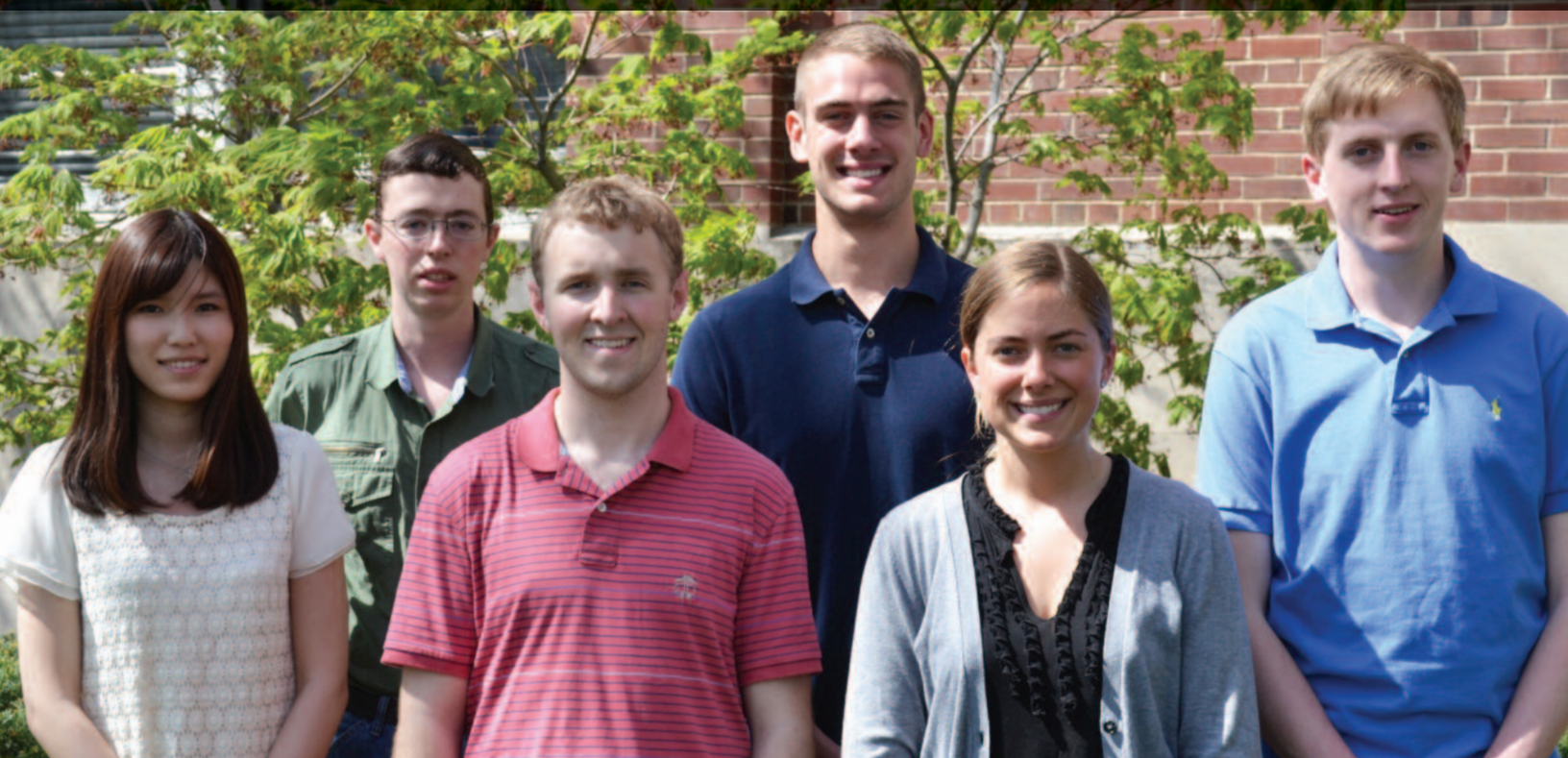
Writers
Liz Ahlberg
Lyanne Alfaro
Bill Bowman
Rick Kubetz
Betsy Powers
Meredith Staub

Designer
Pat Mayer



Bronze Tablet 2013

The University of Illinois began the tradition of inscribing the Bronze Tablets with the names of students receiving University Honors in 1925. MechSE students receiving the honor in 2013 were: (from left) Ruobing Ma, Ian McNamara, Daniel Borup, Caleb Gray, Madison Whitt, and Timothy Ewan.



From the Department Head



On a beautiful Sunday morning in May 2013, we held a brunch to honor the MechSE students who would be graduating that afternoon. Hundreds of students, family members, faculty, staff, and friends joined us in celebration that day, knowing our departing seniors would soon start exciting new chapters in their lives at top corporations and graduate schools. The event held special meaning for me, as these were the students who began their college careers at the same time I became MechSE's department head, back in August 2009.

Now that I have been in this position for four years and have seen that first class through to graduation, I can truly say this has been an eye-opening experience. I have been able to see first-hand how involved the MechSE students are—and their efforts and achievements seem to have increased each and every year. The quality of our students is really quite remarkable. Our undergraduate program is back in the Top 5 in the U.S. We believe our graduate program—ranked Number 7—is at least Top 5-caliber, and we are working hard to be recognized as such. Having four new NSF Fellowship winners can only help in this area. From our graduate students winning both the Cozad Competition and the Lemelson-Illinois Prize, to our undergrads

winning the national Chainless Challenge, MechSE students are really performing as the nation's best.

Given how much they have accomplished in school, it is mind-boggling to think how far these students can ascend in their careers. Perhaps someday a few of them will become MechSE Distinguished Alumni, like 2013 honorees **Jack Levy** (MSTAM '54) and **Karen Thole** (BSME '82, MSME '84), or even College of Engineering Distinguished Alumni, like 2013 honoree **James Ashbrook** (BSME '65, MSME '66). Or maybe they will see a level of career success as high as **Sidney Lu** (BSME '81), a 2011 MechSE Distinguished Alumnus who in 2013 has given us one of the most generous gifts the department has ever received. We are proud and thankful to have outstanding alumni such as these and look forward to learning about our new grads' careers as they unfold.

To continue building a strong pipeline of students into MechSE, we have begun several new efforts. Our Pi Tau Sigma students continue to visit Champaign's Booker T. Washington STEM Academy on a weekly basis, instructing the school's technology club through various engineering lessons. And we are pleased to announce that MechSE will be hosting a GAMES Camp in July 2013. GAMES stands for Girls' Adventures in Mathematics, Engineering, and Science, and

these camps are designed to help draw more high school girls into these critical areas. MechSE faculty members **Elif Ertekin** and **Matthew West** and staff instructor **Joe Muskin** will be leading this effort, which we hope results in greater diversity in the talent pool of young people considering engineering for their field of study.

Our faculty research also continues to get wide attention. In a development covered everywhere from *R&D Magazine* and *Science Daily* to the *International Business Times*, Professor **William King's** team has developed new batteries that may revolutionize the mobile communications industries. In our Spring 2013 magazine, we provided an extensive look at much of the biomechanics and mechanobiology work being done in MechSE. We will be working to frame these areas even more with the 2013-14 Disquisitiones Mechanicae lecture series, in which four leading biomechanics scholars will visit MechSE for two days of presentations and meetings with Illinois faculty and students.

I hope you enjoy reading details on all of these developments and more in the pages that follow.

With best regards,

Placid Ferreira
Department Head
Gracye Wicall Gauthier Professor

Disquisitiones Mechanicae

In this lecture series, four renowned speakers will each spend two days on the University of Illinois campus:

Perspective Lecture
Thursday 4:00 - 5:00 p.m.
(1122 NCSA)
Reception follows.

Biomechanics Seminar
Friday 12:00 - 1:00 p.m.
(2005 MEL)
Discussion session follows.

September 5-6, 2013



Michael Sheetz
Director and Principal Investigator of the Mechanobiology Institute, Singapore, Professor, Biological Sciences, Columbia University
Research area: mechanobiology

November 7-8, 2013



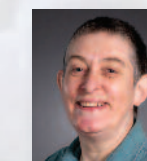
Paul Janmey
Professor, Institute for Medicine and Engineering, University of Pennsylvania
Research area: cell mechanics

February 20-21, 2014



Francoise Brochard-Wyart
Professor, Physical Chemistry, Universit'e Pierre et Marie Curie
Research areas: physics of membranes, cells, and tissues

April 17-18, 2014



Lorna Gibson
Matoula S. Salapatas Professor of Materials Science and Engineering, Massachusetts Institute of Technology
Research area: mechanics of cellular solids

Organizers:

Professor **Jimmy Hsia**
kjhsia@illinois.edu

Professor **Iwona Jasiuk**
ijasiuk@illinois.edu

Professor **Taher Saif**
saif@illinois.edu

Associate Professor **Sascha Hilgenfeldt**
sascha@illinois.edu

Associate Professor **Liz Hsiao-Weckler**
ethw@illinois.edu

Associate Professor **Amy Wagoner Johnson**
ajwj@illinois.edu

MechSE innovation and entrepreneurship continue to thrive

Torrealba wins Lemelson-Illinois Student Prize for soil-moisture innovation

Eduardo Torrealba was inspired. After traveling to Honduras to help develop a hydroelectric generator with the Engineers with a Mission program, he hoped to someday create a similar technology.

"It was something I was pretty passionate about," Torrealba said, "which is developing technologies that will have impacts abroad."

The MechSE graduate student was a step closer to his goal after winning the \$30,000 Lemelson-Illinois Student Prize in March 2013 for creating a soil moisture-monitoring system. Among the people in the audience that night was Torrealba's wife, Lisa.

"She got a basil plant from her parents when we were moving to Illinois from Texas," Torrealba said. "It wasn't doing very well, so I went and just built myself a solution using some electronics, prototyping hardware that I used in the past."

The solution, Plant Link, measures soil moisture and notifies users when it is time for them to water their plants. Torrealba, CEO of Oso Technologies, co-founded the company and created Plant Link in Fall 2011 when he learned that water could either harness growth or kill his household plants. He hopes that Plant Link will make "gardening easier and more enjoyable than ever before."

With a team of six engineers, Oso Technologies consulted plant scientists throughout the world to perfect Plant Link. The company used the first wired Plant Link



Eduardo Torrealba displays the Plant Link products prior to the Lemelson-Illinois Student Prize announcement.



model as a springboard for six other prototypes.

Today, Plant Link uses wireless sensors and a base. Users place the sensor, or links, in the soil next to the plant to measure the moisture in the soil. Then, the data returns back to the base, where it uploads to Plant Link's servers to correlate the information with other factors, including weather patterns and temperatures, to design a custom watering schedule for the plant.

The system allows users to make custom reminders to receive by email, text, or other applications when their plants need watering. If they will not be home at the time, they can hook up their sprinkler or hose to a valve and Plant Link will autonomously water the plants when necessary.

When the company completed the final design in January 2013, Oso Technologies started fundraising on Kickstarter, a funding platform for projects and innovations. By early February 2013, Plant Link had surpassed its initial pledge goal of \$75,000. With help from 877 backers, Plant Link raised more than \$96,000.

"I think the reason that people wanted to back our project is because they saw the product, they knew they had a need for something like that in their lives," Torrealba said. Before launching the Kickstarter campaign, Oso Technologies had already consulted with more than 700 people about ways to improve or better market Plant Link, Torrealba said.

Most recently, Plant Link partnered with SmartThings to make the sensor system compatible with a sys-

tem that monitors and controls a group of devices using a hub device and web services.

As for the future, Torrealba acknowledges Plant Link's potential impact abroad. By 2025, more than 1.8 billion people around the world will suffer from absolute water scarcity. Water management will be important to sustainably manage the amount of water that remains. The Plant Link system waters plants when necessary and saves gardeners and farmers alike from purchasing expensive soil moisture. Oso Technologies has already fielded inquiries from Brazil and Israel on how Plant Link could help with watering crops across the globe.

In the meantime, the company will continue building better versions of Plant Link for its customers. Torrealba expects to launch Plant Link in mid-summer 2013 via The Product Manufactory. The starter set with three sensors and a base station will retail for \$100, a smart valve for \$50, and additional sensors for \$25. Additional information is available at www.myplantlink.com.

Grad student team wins Cozad Competition with personal-protection device

Two MechSE graduate students, Nishana Ismail and Timothy Deppen, won the top prize at the 2013 Cozad New Venture Competition, being chosen as the "most fundable venture" for their personal-protection technology.

Their team, Servabo, intends to create and market a wireless "panic button" of sorts that can be placed on a keychain, a phone case, and other personal accessories. This one-click device, called "AllAlert," would interface with a smartphone via Bluetooth to provide personalized life-saving features, such as sending text, email, and phone messages to emergency contacts and services.

Ismail and Deppen, passionate about women's safety, started talking in the fall of 2012 about trying to find better personal safety solutions. They surveyed their friends and the general community to try to discover what kind of protection most people would want.

"The original idea was to build a more effective pepper spray," Ismail said. "We found that most people would like something by which they could call for help rather than something that is more offensive like a pepper spray. Something like that is still there in the background for us someday maybe, but we are more focused right now on getting people help quickly and easily."

The team wants AllAlert to be very broadly personalized, both in terms of the situations in which it is used and the services that it provides. The button will be able to notify all desired contacts through multiple communication channels and activate additional safety features like an audio/visual alarm or

locking the phone.

Who is contacted and which features are activated can be tailored for each situation. AllAlert can be used in emergency situations such as an assault, or just uncomfortable and potentially unsafe situations in which pulling out a phone and dialing it is too inconvenient or conspicuous. It can even work if the phone is stolen, as long as the button is pressed while it is still within a certain range.

The Cozad New Venture Competition is a contest run by the Technology Entrepreneur Center and the Academy for Entrepreneurial Leadership at the University of Illinois.

"WE FOUND THAT MOST PEOPLE WOULD LIKE SOMETHING BY WHICH THEY COULD CALL FOR HELP RATHER THAN SOMETHING THAT IS MORE OFFENSIVE LIKE A PEPPER SPRAY. SOMETHING LIKE THAT IS STILL THERE IN THE BACKGROUND FOR US SOMEDAY MAYBE, BUT WE ARE MORE FOCUSED RIGHT NOW ON GETTING PEOPLE HELP QUICKLY AND EASILY."

— NISHANA ISMAIL

The competition is designed to encourage students to create new sustainable businesses in the Champaign-Urbana area. Teams create business plans around topics of their choice and are provided mentors and workshops to help them stabilize their business plans. By winning this contest, Servabo received \$25,000 and won acceptance into the I-Start program, which provides 90% funding for the cost of



Photo: Nishana Ismail and Timothy Deppen. Graphic: Some of AllAlert's many functions.

first-year legal services, accounting assistance, and website development.

"The Technology Entrepreneur Center has been fabulous in terms of providing resources and giving guidance," Deppen said. "The Research Park has classes nearly every day with people coming in and talking about how to build a market, how to

entrepreneurs gave them an advantage over the competition by sharing their experiences about building their own ventures.

"It was just a project like anything else," Ismail said, "but the more we got into it, the more we started thinking about it and working on it, we thought that if we could even save one person that would be a great thing. And then it started becoming more than just a project, something more important, and motivated us to try something innovative that will have a positive impact."

The team aims to launch a Kickstarter campaign in Fall 2013, by which time they hope to have a very refined prototype.

"We did a provisional patent, put together the prototype, and have started recruiting people to do some beta-testing of what we have so far," Deppen said. "Now that we won the competition, we kind of have some publicity. We're going to make Servabo official by getting incorporated, creating a website, and promoting the brand in the community."

make a business plan, how to find funding, et cetera."

The team has also received support from entrepreneurs within the MechSE Department, including **Eduardo Torrealba**, winner of the 2013 Lemelson-Illinois Student Prize for his startup Oso Technologies, and **Scott Daigle**, CEO and co-founder of Intelliwheels, Inc. and the winner of the 2011 Lemelson-Illinois Student Prize. The team says these young en-



MechSE's NSF Fellowship winners Harpreet Sangha, Matthew Williams, Anna Oldani, and Jeremy Horwitz.

MechSE grad students win prestigious NSF fellowships

MechSE graduate students **Jeremy Horwitz, Anna Oldani, Harpreet Sangha,** and **Matthew Williams** have received 2013 National Science Foundation Graduate Research Fellowships. The NSF Graduate Research Fellowship Program (GRFP) awards funding and research opportunities to a very small percentage of graduate applicants every year to support the up-and-coming generation of scientific researchers in the United States.

Horwitz is a second-year graduate student working for Professor Emeritus **Pratap Vanka**. He is originally from Austin, Texas, and received his bachelor's degree in mechanical engineering from Cornell University in 2011.

Horwitz's research is in computational fluid dynamics, and his current project is the simulation of multi-phase flows. He has previously researched turbulent particle-laden flows with applications to atmospheric flows. It was MechSE's strength in computational fluid dynamics that originally attracted him to Illinois for graduate school.

"There were a lot of people doing computational fluid dynamics, and all

of them were doing very cool work," Horwitz said. "So I liked that there was a breadth in terms of the professors working in the field, and that the problems that they were looking at were very unique."

Oldani is a first-year graduate student working in the combustion physics group under Associate Professor **Dimitrios Kyritsis** and Professor **Chia-Fon Lee**. She received her undergraduate degree from Illinois in agricultural engineering, during which time she began doing research with Kyritsis. Her agricultural engineering background benefited her current research, she says.

"In agricultural engineering, there is a big push now for advancing alternative fuels and their use in machinery," Oldani said. "Ag engineering looks at both how engines can efficiently use different fuels and also how to improve fuels for various applications."

While she says agricultural engineering gave her a great opportunity to explore various fields, she believes moving to MechSE for graduate school was a very good choice.

"I'm fortunate to have a fun group and a supportive department,

all at one of the top engineering programs," she said.

A native of Fairbanks, Alaska, Sangha is a second-year graduate student. She received her undergraduate degree in mechanical engineering from Stanford University. With her current advisor, Associate Professor **Amy Wagoner Johnson**, Sangha is now researching the mechanical and microstructural properties of cervical tissue.

"The applications of this research are in improving diagnosis of cervical failure, which is a major contributor to preterm births in the United States and elsewhere globally," Sangha said. "Our long-term goal is to develop an innovative biomechanics-based approach for determining risk of premature delivery."

This research could increase understanding and knowledge of cervical biomechanics to potentially improve preterm birth diagnostics. Several factors convinced her to choose Illinois over Stanford for grad school.

"I had an easy time envisioning myself as a graduate student here," Sangha said. "Furthermore, given my interest in medical technology that I

formed through coursework and industry experiences as an undergraduate, I couldn't imagine a better graduate research project."

Williams is a first-year graduate student who received his bachelor's degree in aerospace engineering from the University of Kansas. He became interested in controls through undergraduate research and a controls-oriented internship, and decided that he wanted to pursue it further in graduate school. The MechSE Department stood out to him as a good fit.

"I was looking for professors working in controls," Williams said. "My uncle came to Illinois and encouraged me to look at it. I started by looking at Aerospace, but I found what I wanted once I looked at MechSE."

Williams now conducts research under Professor **Andrew Alleyne**, characterizing multi-timescale and heterogeneous system behavior in aircraft subsystems.

"This department is a lot larger than my undergraduate department," he said. "I like that there are a lot of people to meet in the same department but not all working in the same area."

Fire-suppressing system wins the 2012-13 Innoventor Trophy

For their Senior Design project (ME 470), four MechSE students had a solution to avoid home fires that occur every 87 seconds and cause \$7.1 billion in property damage in the United States each year. They call the targeted suppression system the Self Activated Fire Exterminator (SAFE) System, which was built to detect and effectively suppress fires, while providing active home protection for those on a budget.

Nathan Rapp (BSME '13), the designated team leader, was joined on the team by **Joshua Kim** (BSME '13), **Ian McNamara** (BSEM '13), and **Nicholas Toombs** (BSME '13), with advising from Dr. **Stephen Platt**, to work on the SAFE System in Fall 2012. This spring, the team received the Innoventor Trophy Competition Award, which honors an ME 470 project that extensively draws upon mechanical engineering principles, addresses a societal need, and has the potential for commercialization.

"What it does is provide an alternative to having fire sprinkler systems that can cost between seven and ten thousand dollars just to install in your home," Rapp said. "Whether or not you are home, your home will be safe."

The first SAFE System prototype uses sensors called thermistors—resistors with a resistance that changes based on temperature—to find a fire. When the system detects a fire, a microcontroller interprets the data and sends a signal to open an electronic valve, sets off an LED emergency alert, and uses an algorithm to accurately angle the position of two servo motors. The motors aim a nozzle routed to a tank containing fire suppressant toward the area of tempera-



Top: Nathan Rapp, Ian McNamara, Nicholas Toombs, and Joshua Kim. Right: Prototype of the SAFE System.



ture increase inside the room, and then shoot the suppressant to eliminate the fire and reduce the chance of re-ignition.

The targeting nozzle rotates within a two-axis gimbal device powered by a pair of servo motors. The nozzle allows for the suppressant to be aimed at the fire in the room. The gimbal device that the SAFE System team used for its design rotates 60 degrees on two separate axes for optimum range and precision. Also included in the system's frame design are piping and electronics.

"When a fire started, electronics in the room would feed back into the system and tell it where the hot spot was in the room," Rapp said.

Users can slide the system in between house joists. The amount of space needed for the system is about nine inches tall by 15 inches wide and 24 inches long.

Upon the completion of the SAFE System prototype, the team decided to test the product at the Illinois Fire

Service Institute by simulating a home fire in a fire cell and pitting its performance against that of fire sprinklers.

"We created a fire cell, and we built it out of drywall and wood," Rapp said. "We used drywall because it was resistant to fire, so it was safe. We installed and fabricated mock household joists in the correct dimensions and slid that over the top of the cell. We cut a hole in the drywall in the cell that we created and slid the unit up there and ran all of the electronics, made sure the system was running, and then we started a fire."

Results showed that the SAFE System was more effective than the standard household fire sprinklers at suppressing a fire because of the SAFE System's greater range. Not only did the system put out all of the test fires, but the algorithm control-

ling the servo motors was also able to target the fire within five inches of its exact location.

But the SAFE System team did not halt development on its product at the end of the fall semester. The Innoventor Trophy Competition, which encourages mechanical engineering students to continue working on original projects, supplied the SAFE System project with \$2,000 on top of its original \$5,000 budget after winning the competition's award.

Rapp and his team hope that after the system is patented, it will be used in "high-risk areas" of users' homes, including the kitchen and furnace room. In the meantime, the team will add more sensors to improve the system's target accuracy, build a larger testing area, and continue searching for project funding.



Illinois team wins national Chainless Challenge

The Chainless Challenge Illinois team—consisting of MechSE seniors **Saad Baig, Taylor Beever, David Garb, Elijah Johnson, Ryan Mott, and Greg Wilk**—brought home 1st place in the 2013 Parker Hannifin Chainless Challenge in Irvine, California.

“The guys had worked really hard all year long,” said the team’s faculty advisor, MechSE associate professor **Elizabeth Hsiao-Weckler**. “We were really confident going in that we were going to do very well.”

The competition calls on each team to create a human-powered cycle that is missing the main component that distinguishes it from other vehicles of its kind—a chain. Ten universities from across the nation pitted their chainless bikes against each other in three categories: the Sprint Race (a 200-meter dash), the Endurance Race (an eight-mile circuit race), and the Efficiency Challenge (a braking and restarting challenge). To be eligible for the race, the cycles had to include a fluid transmission, either hydraulic or pneumatic, and they could not use a chain connecting the pedal sprocket to the wheel.

The Illinois team placed second in the Sprint Race, third in the Endurance Race, and third in the Efficiency Challenge. Overall, the Illinois group won first place in Best Presentation and Paper and Best Overall

Score, awards that were accompanied by \$3,500 and \$5,000 prizes, respectively.

“There was a presentation day and a demonstration day. Between the two, I had them practicing late into the night and revising their presentation,” Hsiao-Weckler said. “It paid off.”

The six Engineering Mechanics majors competed in the Chainless Challenge as their Senior Design project (ME 470). Baig, Johnson, and Wilk enrolled in the course for Fall 2012 and Beever, Garb, and Mott took the class in Spring 2013.

The Fall 2012 crew initiated the cycle design. First, they created a tricycle with one chain to test its hydraulic surface, and then they began work on the final creation.

“From the competitions prior, we learned that a chainless design can be pretty unreliable,” Baig said at the group’s Senior Design project presentation. “Using that factor we decided to make two designs.”

The result was the Sun Atlas Cargo 24 Adult Tricycle, a stable cycle with improvements including a better torque input, more space for hydraulic pieces, and a mounting plate. The plate carried the accumulator, valve manifold, motor, pump, and a gear hub. The final gear design was chainless, included four gears from the pedal to the pump, an eight-gear internal hub, and a motor ratio of four to one.

“The team’s design features a hydraulic pump turned by the pedals, which pumps fluid into a hydraulic motor connected to the rear wheel,” Wilk said. “The hydraulic motor then turns the wheel, moving the bike forward.”

A pressure accumulator was also attached to the hydraulic circuit and took on the role of a “pressure vessel” to reserve and release energy.

“This allows the cyclist to pedal at a standstill and charge up energy inside the accumulator,” Wilk said.

“After the accumulator is fully charged, the cyclist switches a valve to send pressure to the motor and accelerate the bike forward, kind of like a turbo boost.”

The team noted that the accumulator became vital during the Efficiency Challenge, when the vehicle was tested for its ability to stop by transforming its kinetic energy into stored energy.

In order for the cyclist to control the pump drive, accumulator charge, accumulator drive, and regenerative braking to race the tricycle in the competition, the team used various controls. Each switch and button corresponded to a valve manifold operation. While the pump drive and accumulator charge were controlled by switches, the accumulator drive and regenerative braking were commanded by the push of a button.

“It is just an aluminum block with different channels in it that will open certain parts and control all of these functions,” Wilk said.

The Chainless Challenge is a project available to ME 470 students each academic year. Illinois students have participated in the Parker Hannifin competition nearly every year since 2005. Their 2013 victory is Illinois’ second first-place finish, having won in 2005.

Associate Professor Elizabeth Hsiao-Weckler and the 2013 champion Chainless Challenge Illinois team.



Student Honors 2012-13

MechSE Graduate Awards

Hassan Aref Memorial Award for Theoretical and Applied Mechanics
Navin Fogla

James O. Smith Memorial Award
Harishankar Manikantan

Outstanding Teaching Assistant in Mechanical Engineering
Alexander Hoyne

Outstanding PhD Graduate in Mechanical Engineering
Wonmo Kang

Stanley I. Weiss Outstanding Thesis Award
Reetesh Ranjan

MechSE Departmental Awards

Bei Tse & May Chao Award
Daniel Borup
Zachary Renwick

Clarence L. & Harriette Johnson Award
Bruno Abdelnour

O. A. Leutwiler Award
Ian McNamara
Kathryn Neville

Fred B. Seely Award
Daniel Borup

Marvin C. Stippes Award
Michael Holz
James Leigh

MechSE Interest Area Awards

Caterpillar Award
Max Methling

John C. & Elizabeth J. Chato Award in Bioengineering
Zachary Berent
Niket Patel

A. G. Friederich Memorial Award
Michelle Boehm

George W. Harper Award
Hyder Arain
Paul Hummon
Mark Teramoto
Zachary Weiner

Helmut H. Korst Award
Jacob Avery
Timothy Ewan
Alexander Wendling

Materials Processing Award
Patrick Feltman

T. A. Peebles Award
Jonathon Schuh

T & AM Merit Award
Gregory Wilk

Swanson Environmental Sustainability Award
Ann Zuzuly

Kenneth J. Trigger Award
Andrew Bell
Valeria Laguna
Madison Whitt

MechSE Student Society Awards

Konzo/ASHRAE Engineers Award
Randy Lee

ASME Junior Leadership Award
Ryan Sawyers

Patrick B. & Janet A. Flanagan ASME Senior Leadership Award
Christine Littrell

Pi Tau Sigma Sophomore Award
Christopher Johnson

James W. Bayne Award for Outstanding Senior in Pi Tau Sigma
Stuart Herndon
Megan Kubacki

James W. Bayne Award for Outstanding Senior Design Project
Stan Chang
Christine Littrell
Zachary Milroy
Niket Patel

Student Outreach Award
Aubrey Heck
Sean Raines

GM/Philip W. Leistra Jr. Society of Automotive Engineers Award
Michael Gomez

Undergraduate Student Project Awards

Leonard Fieman Student Research Award
Michael Angelini

Innoventor Trophy Competition Award
Joshua Kim
Ian McNamara
Nathan Rapp
Nicholas Toombs

“What Is MechSE” Video Contest Award
Paul Hummon
Valeria Laguna

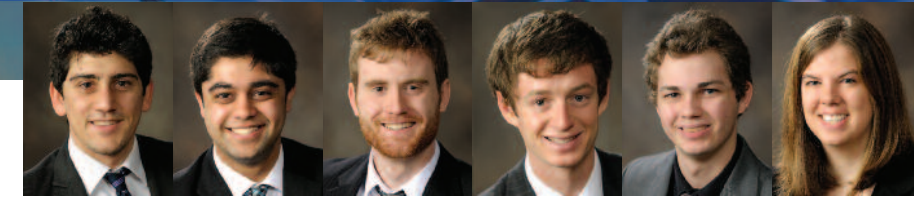
College of Engineering Awards

Harvey H. Jordan Award
Daniel Borup

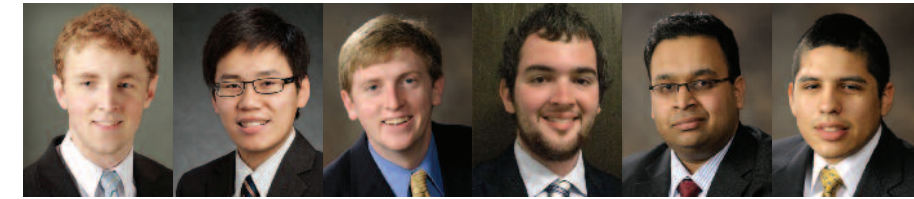
Knights of St. Patrick
Valeria Laguna
Christine Littrell

University Honors

Bronze Tablet
Daniel Borup
Timothy Ewan
William (“Caleb”) Gray
Ruobing Ma
Ian McNamara
Mustafa Mohamad
Madison Whitt



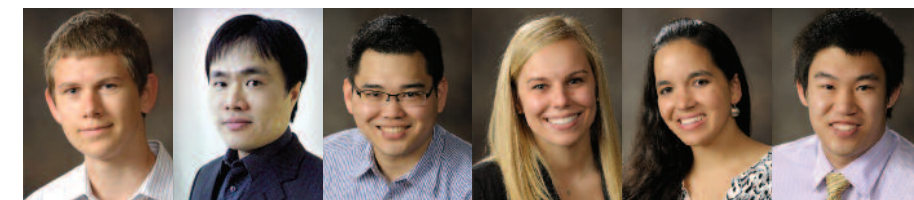
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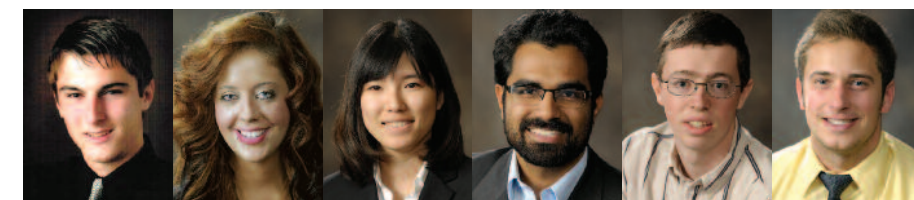
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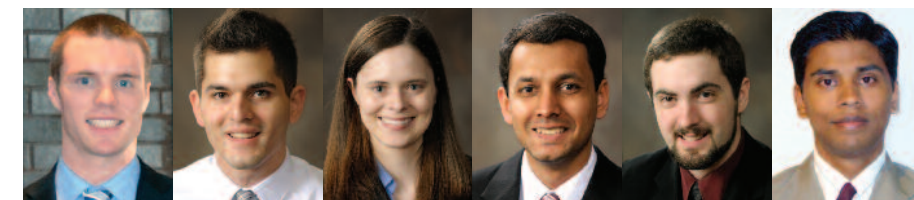
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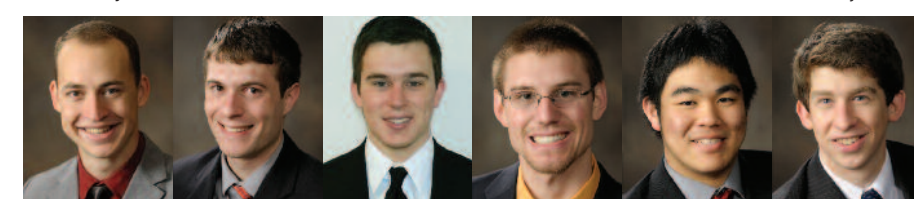
Johnson Kang Kim Kubacki Laguna Lee



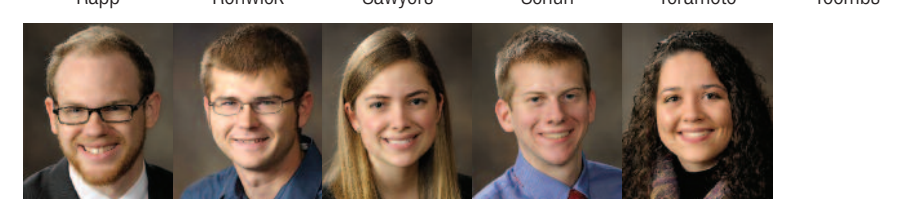
Leigh Littrell Ma Manikantan McNamara Methling



Milroy Mohamad Neville Patel Raines Ranjan

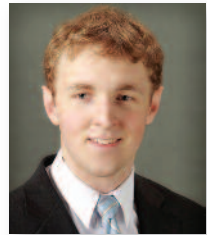


Rapp Renwick Sawyers Schuh Teramoto Toombs



Weiner Wendling Whitt Wilk Zuzuly

Senior year & graduation = just the beginning for MechSE award winners



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A couple hours before the Illini basketball team defeated No. 1-ranked Indiana in February 2013, MechSE senior **Daniel Borup** (BSME '13) sang the national anthem to the raucous Assembly Hall crowd.

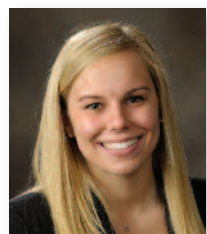
"I grew up in Champaign," Borup said. "I've been hooked on Illinois sports for a long time."

In addition to his many singing gigs—from women's gymnastics to White Sox games—Borup was the president of Illini Pride, the largest registered student organization on campus with over 3,600 members, encompassing Orange Krush, Block I, and many others.

His outstanding academic record won him the Bei Tse & May Chao Award and the Fred B. Seely Award, as well as a place on the University's 2013 Bronze Tablet. He also received the Harvey H. Jordan Award from the College of Engineering.

Borup also became involved in entrepreneurship. He and his business partner, longtime friend **Evan File**, manage their own startup company, HigherMed, Inc., which develops unique and useful medical products. HigherMed, Inc. won the 2012 Adobe Technology Innovation Prize.

In Fall 2013, Borup will attend Stanford University's Mechanical Engineering graduate program as a Stanford Graduate Fellow.



Uop

A Honeywell Company

Megan Kubacki (BSME '13) stood before a group of Booker T. Washington STEM Academy students

in Fall 2012. Kubacki and other members of Pi Tau Sigma visited BTW weekly to help educate students on science topics ranging from erosion to jet propulsion through lectures and experiments.

The teacher announced, "See? Women can be engineers, too." One of the kids did not miss his opportunity to interject, "No, they can't!"

At that moment, Kubacki made it her goal to show the students that women can be great engineers.

"It was nice to show the students that we can perform well in engineering and inspire other women to do that, too," Kubacki said.

As PTS vice president, Kubacki improved the society's corporate relations, reaching out to companies and bringing them in to give presentations. She also organized a Spring 2013 soccer tournament in honor of Professor **Mark Shannon**, who passed away from Lou Gehrig's disease in October 2012. These contributions and others earned her a James W. Bayne Award for Outstanding Senior in Pi Tau Sigma this spring.

Now that she has graduated, Kubacki will work as a mechanical design engineer at Honeywell-UOP in Des Plaines, Illinois. She will be responsible for efficient processes and designing oil refinery reactors.



EXXON

Mobil

To say **Christine Littrell** (BSME '13) had a busy senior year would

be an understatement. She served as the head Engineering Learning Assistant (ELA) for Engineering 100 and the president of the American Society of Mechanical Engineers (ASME), a role which called on her to act as a liaison between the board, society members, MechSE, and the national ASME.

"I make sure that we highlight the things that the department would like us to focus on," Littrell said, "so, offering services to students and hosting events to better the students in mechanical engineering."

In Spring 2013, she was awarded the Patrick B. & Janet A. Flanagan ASME Senior Leadership Award. The award recognizes a student for leadership within the organization.

After visiting Pennsylvania State University for the Engineering Ambassador Program National Workshop in Summer 2012, she helped implement the program at Illinois. The Ambassadors

partake in outreach service, communications with the College, and other professional experiences.

Littrell was also named a Knight of St. Patrick and made the Senior 100, and she participated on the Senior Design team that won the James W. Bayne Award in December 2012. Having graduated, she will be joining ExxonMobil full-time as a Refining and Chemicals Fixed Equipment Engineer.



I

In 2012, **Ian McNamara** (BSME '13) helped initiate a finite element model of the human

brain. He spent his summer at the Naval Research Center in Washington, D.C., performing preliminary research and modeling the brain with a cellular wall to study the effects of blast on the brain.

Since blast effect symptoms are not always apparent immediately, it is difficult for doctors to foresee how much damage the brain will experience. McNamara's research focused on the effects of blast on the brain at a microscopic level.

"Being able to predict the blasts' costs and damages will help our doctors treat the soldiers faster and help them respond to treatments faster," McNamara said.

Although McNamara only took part in the early steps of a long-term project, he anticipates that his research will help the model advance in the future and on a larger scale.

In Spring 2013, McNamara won the O. A. Leutwiler Award, which honors a senior in Mechanical Engineering or Engineering Mechanics for his or her personal qualities, scholarship, and professional and cultural activities. He was also named to the University's Bronze Tablet and was part of the Innoventor Prize-winning team.

In Fall 2013, McNamara will return to Illinois for graduate school.



>

accenture

For the Fall 2012 Senior Design class, **Niket Patel** (BSME '13) and his team designed a hydraulic filter sensing system for

Caterpillar. The team's success was recognized with the James W. Bayne Award for Outstanding Senior Design Project.

"The filter gets clogged with particulate like dust, dirt, and mud," Patel said, "all sorts of things, because this is a pretty rough environment, as you would imagine, with a mining application."

Caterpillar's former method for changing the filters was placing a new one every set amount of hours and then repeating the process. The team's solution was to develop a filter life system that used sensors to quantify the pressure drops in the filters.

Patel also served as vice president of internal affairs for ASME and was the internal marketing director for the 2013 Engineering Open House. He was an active member in the Dean's Student Advi-



sory Committee in the Engineering Council and worked to find solutions to student issues and to improve communication between students and the deans.

Patel received the John C. & Elizabeth J. Chato Award in Bioengineering, which is awarded to an outstanding undergraduate student involved in several projects and activities relevant to the area. He also was named to the University's Senior 100.

He will be assuming a full-time consulting position with Accenture in July 2013.



The building of spaghetti bridges, marshmallow structures, and paper boats are all activities

Sean Raines (BSME '13) directed on many Tuesday afternoons during his junior and senior years. A member of Pi Tau Sigma, Raines taught 30 Booker T. Washington (BTW) STEM Academy students science, technology, engineering, and math topics ranging from erosion to conductivity.

"It is important that businesses and companies everywhere try to help promote the STEM fields and initiatives," Raines said. "They are a critical aspect of fostering further innovation and progress."

In Spring 2013, Raines was awarded the Student Outreach Award, in part for his dedication to the Technology Club at BTW.

Raines also was involved in Baja SAE, helping build and compete each year's car.

Daniel Borup performs the national anthem before the Illinois-Indiana men's basketball game in February 2013.

"I am more or less an assistant to the members who take it as a senior design course," Raines said. "I help a lot with fabrication."

After graduation, Raines is headed to a job at Great Lakes Dredge and Dock Company in Oak Brook. He interned at the company for two summers during college. He said he would like to return to campus to share his real-world experiences with students.



EXXON

Mobil

Madison Whitt (BSME '13) likes to prevent products from failing. If something fails, she

looks into the manufacturing process and how to fix it. Engineers call her area of concentration fracture mechanics. To Whitt, a senior in MechSE, it is just second nature.

"I think it is interesting in general, talking about how you can manufacture what you need, get raw materials, and how do you get the right parts," Whitt said.

In Spring 2013, her research and experience in manufacturing were rewarded with the Kenneth J. Trigger Award, presented to a senior who has shown enthusiasm, scholarship, and excellence in the area. She was also named to the University's Senior 100 and Bronze Tablet.

In Summer 2011, following her sophomore year, she traveled to Seattle, where she worked on design for Boeing. The following summer, she worked at ExxonMobil Corporation in Joliet, where her projects involved performing pipe stress analysis models. Whitt said that she got a more hands-on experience with her work at the oil refinery.

"That's why I enjoy manufacturing," Whitt said. "You can definitely see it more, and I like it like that. I like being on my feet a little bit more than in engineering. Being in a refinery, I got that kind of experience."

Post-graduation, she is joining ExxonMobil full-time as a unit Mechanical Contact Engineer.

Lu's gift to benefit college, department, faculty, and students



Sidney Lu addresses MechSE's alumni board at its Spring 2011 meeting.



Sidney Lu

MechSE alumnus **Sidney Lu** (BSME '81) places great value on both family and education. This was reflected in a big way when he recently made a \$5 million gift to support the Department of Mechanical Science and Engineering and the College of Engineering.

"It is impossible to measure the many benefits of such a gift," said MechSE department head **Placid Ferreira**. "Sidney's accomplishments are an inspiration to our current students and his generosity will have a profound and lasting impact on our future students."

The Foxconn executive's gift will generate three new funds, one of which will create the **Tungchao Julia Lu** Professorship in Mechanical Science and Engineering, named for his mother. Professorships such as this greatly help the department by funding a professor with a blossoming re-

search program to ensure it develops to its full potential. A candidate to be the first holder of this professorship is currently being identified.

"I really appreciate the faculty's efforts and dedication to education," Lu said.

The second fund will go toward the overall MechSE Department, and the third fund will create new scholarships throughout the College of Engineering. The scholarship-winning students will be known as "Sidney Lu Engineering Scholars."

All three funds were established to honor Mrs. Lu, who raised three proud Illinois graduates in Sidney and his brothers, Nicholas and Christopher. Born in 1930, the second of eight children, Mrs. Lu was college educated at a time in which that was a rarity throughout much of Asia. An ardent supporter of education, Mrs. Lu sent all three of her children

abroad for higher education, and they all attended Illinois at roughly the same time. She is pleased that one of her grandchildren will be entering the Computer Science program in Fall 2013, continuing the Lu tradition in Engineering at Illinois.

From 1979 to 1981, Mrs. Lu lived in Champaign to visit her sons. She took classes at Parkland College and made many friends in the community. Among them were **Dorothy Garland** and her daughter, **Mrs. Richard Green**, as well as former

"Professor Soo taught me two thermodynamics classes," Lu said. "He was the one that aroused my interest in mechanical and thermal engineering. Until this day, I still recollect some of the equations he taught us in class. He was also the one that suggested for me to look into the Placement Office for a summer job and career advice."

Lu's career at Foxconn has evolved beyond engineering and into the running of the business at its highest levels. He attributes his

Today, Lu is the corporate executive vice president of Foxconn and general manager for its Network Interconnection Business Group (NWInG)—one of the world's top five employers. He is also a member of the board of directors of Hon Hai Precision Industry Co. Ltd.—the parent company of Foxconn. The rate that these companies have grown has been matched by Lu's ascension through the ranks.

"When we first started, we were not even ranked in the Top 50 of the



Tungchao Julia Lu

"IT IS IMPOSSIBLE TO MEASURE THE MANY BENEFITS OF SUCH A GIFT. SIDNEY'S ACCOMPLISHMENTS ARE AN INSPIRATION TO OUR CURRENT STUDENTS AND HIS GENEROSITY WILL HAVE A PROFOUND AND LASTING IMPACT ON OUR FUTURE STUDENTS."

—PLACID FERREIRA

Sidney Lu converses with Ilesanmi "Ade" Adesida, who was then the Dean of the College of Engineering and now is the Vice Chancellor for Academic Affairs and Provost of the Urbana campus.



"I REALLY APPRECIATE THE FACULTY'S EFFORTS AND DEDICATION TO EDUCATION."
—SIDNEY LU

Illini basketball coach **Lou Henson's** daughter, **Lisa**. Mrs. Lu now lives in Taipei and is still very active with fond memories of her time in Champaign.

An interesting coincidence is that one of Sidney Lu's most influential professors at Illinois, the late Professor **Shao Lee Soo**, provided gifts to MechSE in honor of his own mother, **Yunchuan Aisinjiro-Soo**. Like Mrs. Lu, Mrs. Soo was a great believer in education, and it is in her honor that MechSE has the Soo Professorship and the annual Soo Lectureship, through the generosity of Shao Lee and his wife, **Hermia**.

success in this area partially to the elective courses he took at Illinois.

"Accounting 101 prepared me on the basics of how to decipher the balance sheet, income statement, and so forth," Lu said. "The not so obvious course was Greek Mythology. At the time, it may have seemed like a course to fulfill my social studies requirement. But since Western civilization is so heavily influenced by Ancient Greece, it prepared me to deal with theater, art, and even current movie hits (i.e. Clash of Titans) a lot easier. This makes me blend in a lot better in social and business gatherings."

connector industry," Lu said. "We are now in the Top 5 and the largest in the computer industry. Also, we are recognized by IBM and Intel as the technology leader."

In 2011, Lu returned to Illinois to receive the Mechanical Science and Engineering Distinguished Alumni Award. He was accompanied to campus by his mother's brother, **Clifford Lai**, who was one of the driving forces behind the Lu brothers attending Illinois. Lai sponsored them and enabled them to obtain residence status.

Highly decorated alum receives **MechSE** award



2013 Distinguished Alum Jack Levy and his wife, Sheila.

Professor **Jack Levy** (MSTAM '54) is a Chartered Engineer currently engaged in engineering consultancy, having completed a career at the UK Engineering Council and the City University, London, where he is now a professor emeritus. In April 2013, he received a Distinguished Alumni Award from MechSE.

Levy was born in London in 1926 and received his primary engineering education at Imperial College where, in wartime, he took his final examinations during air raids. After several years in the aircraft design industry, he joined the City University, London as an Assistant Lecturer and then earned an award that brought him overseas.

"Way back in 1953 I applied for—and was fortunate enough to gain—a Fulbright Award, symbolic of post-war Anglo-American relations," Levy said. "I then selected as my destination the University of Illinois because of its track record in materials research."

Having recently married, he brought his wife, Sheila, with him to Illinois on what was essentially an extended honeymoon. Now, 60 years later, they have three children and seven grandchildren.

"Towards the end of that academic year we bought a Studebaker from a departing student—the custom in those days—and we drove all the way to San Francisco and then back to New York where I sold the car for \$50 more than I paid," Levy said. "And then back to City University, London, where I eventually became a professor."

Returning to London and his post at City University, he built up his research work, gained his PhD, and eventually became a Professor and Head of Mechanical and Manufacturing Engineering. He was Deputy Vice-Chancellor of the entire university in the 1970's and 1980's and director of a "spin-off" university company named City Technology, Ltd. Also, for 20 years, he consulted

on ship structures for Shell International Marine.

Then, in 1983, he joined the newly formed National Engineering Council as Director - Engineering Profession. In this post, he carried executive responsibility for the national development of Engineering Degree and Training standards and for the international contacts of the profession to negotiate agreements for the mutual recognition of engineering degrees. In 1999, he was awarded the Gold Medal of the World Federation of Engineering Organisations (WFEO) for his international contribution to professional engineering education.

Having "retired" more than once, Levy has now returned to his roots as a design engineer. He runs Levytator, Ltd., a company formed to exploit his new design of a multi-curving escalator, which has been patented in Europe, the United States, and China.

Levy is a Fellow of the Royal Academy of Engineers, the Institution of Mechanical Engineers, the Royal

"THEY LAUNCHED ME ON A LIFELONG PATH OF RESEARCH AND DEVELOPMENT FOR WHICH I AM PROFOUNDLY GRATEFUL."
— JACK LEVY

Aeronautical Society, and the Irish Academy of Engineering. In 1984, the royal honor of an Order of the British Empire was conferred upon him, and he is a Freeman of the City of London. He holds honorary doctorates from four universities in the United Kingdom.

While he spent only one year at the University of Illinois, it had a lasting impact on him. In particular, he credits professors **Tom Dolan** and **George Sinclair** for their valuable guidance.

"They launched me on a lifelong path of research and development for which I am profoundly grateful," Levy said. "I have in front of me a copy of my Master's thesis awarded in 1954, titled 'A Study of Strain-Aging in Fatigue,' of which now I am a prime example!"

He said his MechSE Distinguished Alumni Award will occupy a place on the wall of his study, a "constant reminder of an enjoyable and fruitful year."

Penn State Department Head receives award, honors **Korst**

Dr. **Karen A. Thole** (BSME '82, MSME '84) returned to campus in April 2013 to receive a Distinguished Alumni Award from the MechSE Department.

"Given the many outstanding engineers that the University of Illinois has educated and how many excellent engineers that have been educated specifically by the Mechanical Engineering program, this recognition is even more humbling," Thole said. "Personally, I know that having degrees in Mechanical Engineering from the University of Illinois opened many doors for me and continues to do so."

Thole was the last graduate student of the late Professor Emeritus **Helmut Korst**. After leaving Illinois, she earned a doctorate from the University of Texas at Austin, and then spent two years as a post-doctoral researcher at the Institute for Thermal Turbomachinery at the Karlsruhe Institute of Technology in Germany. She then embarked on her academic career, which began with an assistant professor position at the University of Wisconsin-Madison. In 1999, she moved to the Mechanical Engineering Department at Virginia Tech, where she was promoted to full professor in 2003 and was recognized as the William S. Cross Professor of Mechanical Engineering in 2005.

In 2006, Thole accepted the position of Head of the Department of Mechanical and Nuclear Engineering at The Pennsylvania State University. She continues to hold this position today.

"Through my positions in academia, I have had the opportunity to meet many Illini alumni who are working in industry, government labs, and academia," Thole said. "Many of those individuals have made impacts in the field, have been recognized for those contributions, and have been placed in important positions—leading companies, educating students, or making decisions that affect our nation."

Thole has published over 180 peer-reviewed archival journal and conference papers and advised over 50 theses and dissertations. She founded the Experimental and Computational Convection Laboratory (ExCCL), which studies convective heat transfer. Her research has in-

cluded the development of a novel fillet design, now used in gas turbines to reduce heat transfer arising from vortices, and the development of microchannel cooling through the acquisition of detailed data.

As a Fellow of ASME, she serves many roles: member of the Board of Directors for the International Gas Turbine Institute, Chair of the ASME-ME Department Head Executive Committee, member of the Vision 2030 Committee, and Chair of ASME's Committee on Honors.

Even with so many responsibilities, she remains truly dedicated to education. She has been recognized by the U.S. White House Champion of Change for recruitment efforts in STEM (Science-Technology-Engi-

neering-Mathematics) and has received Penn State's Rosemary Schraer Mentoring Award. She has also worked hard to develop a mentoring program in which her department's students connect with alumni for advice on school, careers, and more.

When she addressed current MechSE students at the department's 2013 Awards Banquet, she shared a story from her time as an undergrad that still impacts her today.

"I was trying to take measurements with a home-built laser Doppler velocimeter, but it wasn't working because I accidentally dropped the beam splitter that then cracked," she said. "I was walking down the hallway with tears in my eyes when I ran into my advisor, Professor Korst. The only words out of his mouth were, 'Go get your coat and meet me at my office.'"

At that point, Korst took Thole directly to Baskin-Robbins, where they each enjoyed a double scoop while talking about many things, but not the beam splitter. The next day, she attempted the experiment with a refreshed attitude—and it worked.

"It was the kindness that Professor Korst showed that inspires me today as a teacher," Thole said. "I, too, have taken a few students out for ice cream, and it really works."

Dr. Karen Thole receives her MechSE Distinguished Alumni Award from Department Head Placid Ferreira.





James Ashbrook (left) receives the College of Engineering Distinguished Alumnus Award from Dean Michael Bragg.

MechSE alumnus and technology leader receives College of Engineering honor

James Ashbrook (BSME '65, MSME '66) has been a visionary and entrepreneur in the information technology industry for more than 35 years, holding senior positions in computer hardware and software firms, co-founding a pioneer IT software and professional services firm, and serving as a catalyst for several startup computer software companies. At its Spring 2013 awards ceremony, the College of Engineering honored Ashbrook with a Distinguished Alumni Award "for tremendous success in the information technology industry and for his generous commitment to the University of Illinois."

"The value of a U of I engineering education is broad," he told the students in attendance. "We obviously get a very strong technical education and skill set, but coming out of that I think we've all learned logical thinking based on facts, not on emotion, and how that applies to the problems we face. We have learned that perseverance and a commitment to excellence is necessary to be successful.

"Do not be afraid to fail. I think I

was perhaps afraid to fail when I started out on my first jobs, but I found out that you can step a lot further a lot faster if you take some risk, and it'll turn out all right."

After completing his master's degree, Ashbrook worked 12 years for IBM in Springfield, IL and Princeton, NJ before accepting posts as Vice President of Systems Marketing at National Advanced Systems, Vice President of Sales and Marketing for CXI, Inc., and Vice President of Marketing and Senior Vice President of Marketing for AST Research Corporation, which designed, manufactured, marketed, serviced, and supported a diverse line of personal computers.

In 1991, Ashbrook co-founded Prism Solutions, Inc., which set out to help companies understand, manage, and utilize business information effectively. Ashbrook served as the President and Chief Executive Officer until 1997 for Prism, which went public in 1996. Ashbrook stepped down from that post to continue solely as Chairman in order to focus his efforts on strategic planning and direction,

technology acquisition, and international market development. By 1998, Prism had more than \$52 million in revenue, 350 international customers, and 20 regional offices, 11 of those internationally.

After retiring from Prism and selling his interests to Ardent Software, Ashbrook focused his attention on helping small businesses grow within the computer industry. He became heavily involved in the Band of Angels, a Silicon Valley organization dedicated to funding and advising startups, and the Sierra Angels, located in Incline Village, NV, specializing in software and energy solutions.

His passion for helping startups was evident in his remarks to the engineering students.

"In your career, I urge you to consider not only the technical and the engineering aspects, but management, business, and entrepreneurship," he said. "I was very pleased with the meetings I was able to join yesterday about the emphasis on entrepreneurship; I've been fortunate

in my career to work in all of those categories. There's a lot of opportunity out there—take advantage of it when you can."

A life member of the University of Illinois Alumni Association, Ashbrook established an endowment to create the James W. Ashbrook Scholarship Fund in the MechSE Department. In 1998, he was honored with the Distinguished Alumni Award for his generous and continued support of the department.

"As you go through your careers, put aside some money each year and manage your financial future for both yourself and your family," Ashbrook said. "There's no one else that's going to be responsible for that, and we all have to step up to that personal responsibility.

"From the standpoint of where you start your career to where you end, what's important changes a bit, and I think family and spending time with your family is very, very important. Make sure you work on having a balance between your family and your career."

"DO NOT BE AFRAID TO FAIL... YOU CAN STEP A LOT FURTHER A LOT FASTER IF YOU TAKE SOME RISK."

— JAMES ASHBROOK

Alumni Notes



Brian Beird (BSME '78) was inducted as the newest member of the MechSE Alumni Board at the 2013 Spring Alumni Board Meeting on April 19. Beird is a principal of the Beird Group and the

company's Chief Financial Officer. The Beird Group is composed of experienced consultants that work as teams to develop critical business solutions that elegantly solve the challenges of their clients. Previous to the Beird Group, he served in a variety of roles for ExxonMobil Corporation throughout his 32 years with the company. He retired from ExxonMobil as a Regional Taskforce Lead and Senior Project Management Advisor along with serving as Captain of ExxonMobil's Recruiting Team for the University of Illinois. He is a certified Project Management Professional by the Project Management Institute and serves as a volunteer project engineer for Engineering Ministries International.



Jeff Fullilove (MSME '00) currently serves as the Team Leader for the Design and Tolerance Analysis Team in Caterpillar's Simulation Center in Champaign. He is responsible for design and

structural analysis of machine systems and structures. Within the last year, Fullilove has been heavily involved in the structural analysis of Caterpillar's next generation of transmissions, and he has designed heavy structure for Caterpillar's articulated trucks. Fullilove is currently doing conceptual design work for CAT's largest motorgrader, the 24M. Caterpillar's facility in Champaign is unique in that one of its primary functions is to serve as a pipeline for engineering talent into CAT. He works extensively with Illinois engineering students and typically involves at least two to three students in all of his projects. Fullilove says he finds it very rewarding to watch the students grow and develop into productive engineers.

We'd like to hear from you!

If you have news you'd like to share with us and your fellow alums, please contact Betsy Powers at epowers2@illinois.edu. Thanks!



Nancy M. Niemerg (BSME '08) comes from a family of University of Illinois graduates, including her father (BSME '82), sister (BSME '10), and brother (BSEE '13). She graduated from Illinois in December of 2008, and

started working as a Manufacturing Engineer for Babcock and Wilcox, Nuclear Operations Group, Inc. While working full time, she completed her MBA in December 2011 and was offered a Project Engineering position with her company following graduation. For the past four years, she has been invited to speak with the Mechanical Engineering Seminar class about her experiences as a student as well as mechanical engineering opportunities after graduation. While working as a Project Engineer, she is also training to become a certified yoga instructor by the end of 2013. Niemerg enjoys applying engineering principles to all aspects of life, and she believes this understanding will benefit her future students.



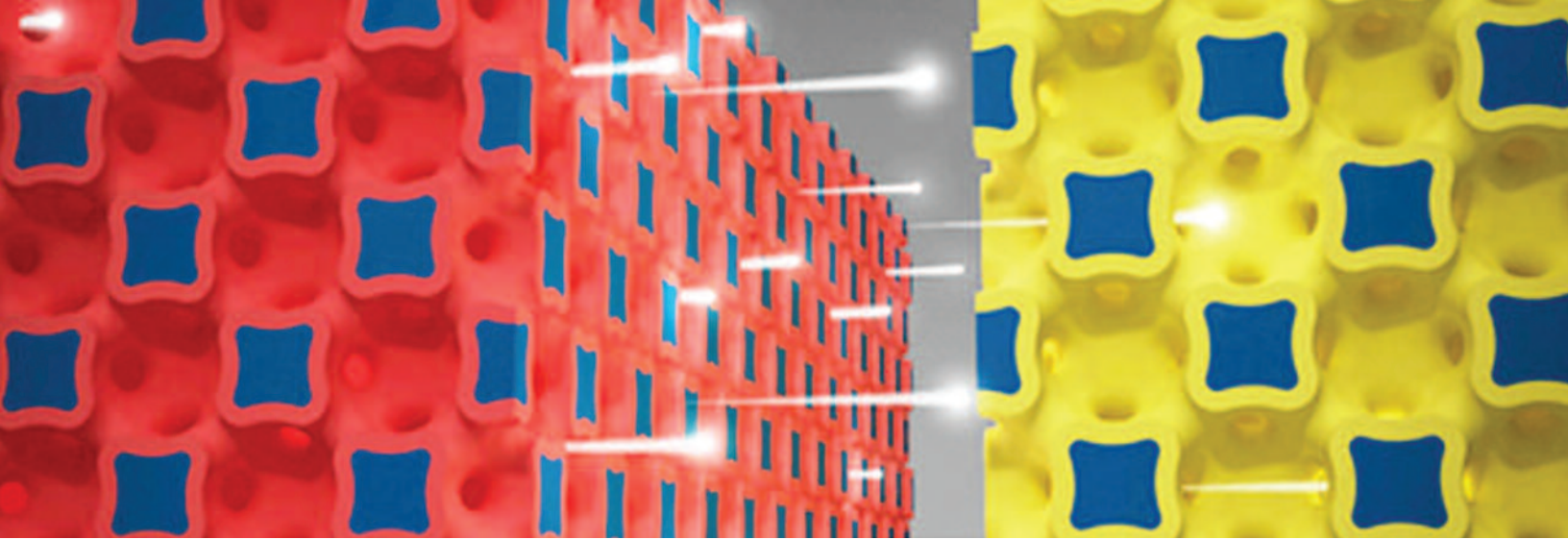
Pi Tau Sigma Illinois Alumni Association—The University of Illinois established the first chapter of Pi Tau Sigma (PTS) on March 16, 1915. As the honorary society for Mechanical Engineering students, PTS fosters the ideals of the engineering profession, stimulates interest in departmental activities, and promotes professional welfare to its members. Recently, the Pi Tau Sigma Illinois Alumni Association was formed to help develop these principles after graduation. This group is a network of former Pi Tau Sigma members that graduated from the University of Illinois at Urbana-Champaign. In addition to providing member benefits, the PTS Illinois Alumni Association is developing initiatives that connect current PTS members to alumni members such as planning alumni events on campus and mentoring seniors on the transition to a full-time career. If you are a former member of PTS and would like to join this exciting, newly formed group, please email PTSillinoisAlumni@gmail.com for more information.



Steve Blakely (BSME '69) currently works as a chief engineer for Neurovision Medical Products, but for fun he likes to think about solving ancient mysteries. He sponsored a Spring 2013 MechSE Senior Design project called "Egyptian Pulley," in which four students advanced his work on proving a theory about how the Great Pyramid was built. This pulley would have allowed ancient Egyptians to raise the 2.3 million stones (each 5,000 pounds!) from which the structure was built. The prototype pulley built by the students will be part of the Ancient Egypt display at the Spurlock Museum on campus through mid-September 2013.



The team's pulley is displayed beneath three explanatory posters at Spurlock Museum.



Ions flow between three-dimensional micro-electrodes in a lithium ion battery.

Small in size, big on power: New microbatteries a boost for electronics

Though they are little, they are fierce. The most powerful batteries on the planet are only a few millimeters in size, yet they pack such a punch that a driver could use a cellphone powered by these batteries to jump-start a dead car battery—and then recharge the phone in the blink of an eye.

MechSE professor **William P. King** led a group that developed the most powerful microbatteries ever documented.

The new microbatteries out-power even the best supercapacitors and could drive new applications in radio communications and compact electronics.

Led by King, the Bliss Professor of Mechanical Science and Engineering, the researchers published their results in the April 16 issue of *Nature Communications*. Media outlets worldwide quickly took the news global.

“This is a whole new way to think about batteries,” King said. “A battery can deliver far more power than anybody ever thought. In recent decades, electronics have gotten small. The thinking parts of computers have gotten small. And the battery has lagged far behind. This is a microtechnology that could change all of that. Now the power source is as high-performance as the rest of it.”

With currently available power sources, users have had to choose between power and energy. For applications that need a lot of power, like broadcasting a radio signal over a long distance, capacitors can release energy very quickly but can only store a small amount.

For applications that need a lot of energy, like playing a radio for a long time, fuel cells and batteries can hold a lot of energy but release it or recharge slowly.

“There’s a sacrifice,” said **James Pikul**, a MechSE graduate student and first author of the paper. “If you want high energy you can’t get high power; if you want high power it’s very difficult to get high energy. But for very interesting applications, especially modern applications, you



William P. King



James Pikul

really need both. That’s what our batteries are starting to do. We’re really pushing into an area in the energy storage design space that is not currently available with technologies today.”

The new microbatteries offer both power and energy, and by tweaking the structure a bit, the researchers can tune them over a wide range on the power-versus-energy scale.

The batteries owe their high performance to their internal three-dimensional microstructure. Batteries have two key components: the anode (minus side) and cathode (plus side). Building on

a novel fast-charging cathode design by Materials Science and Engineering professor **Paul Braun**’s group, King and Pikul developed a matching anode and then developed a new way to integrate the two components at the microscale to make a complete battery with superior performance.

With so much power, the batteries could enable sensors or radio signals that broadcast 30 times farther, or devices 30 times smaller. The batteries are rechargeable and can charge 1,000 times faster than competing technologies—imagine juicing up a credit-card-thin phone in less than a second. In addition to consumer electronics, medical devices, lasers, sensors, and other applications could see leaps forward in technology with such power sources available.

“Any kind of electronic device is limited by the size of the battery—until now,” King said. “Consider personal medical devices and implants, where the battery is an enormous brick, and it’s connected to itty-bitty electronics and tiny wires. Now the battery is also tiny.”

Now, the researchers are working on integrating their batteries with other electronics components, as well as manufacturability at low cost.

“Now we can think outside of the box,” Pikul said. “It’s a new enabling technology. It’s not a progressive improvement over previous technologies; it breaks the normal paradigms of energy sources. It’s allowing us to do different, new things.”

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

SIIP brings large classes up to the highest standard

The College of Engineering has long been challenged by its largest classes—those containing 500 to 1,000 students—and how to have the quality of them meet the standard of the majority of its classes, which are much smaller and more manageable.

The early results from a newly launched initiative to meet this challenge—the Strategic Instructional Initiatives Program, or SIIP—have been extremely encouraging. Before he moved on to tackle similar challenges at the University level (see page 20), MechSE Professor and College of Engineering Associate Dean for Undergraduate Programs **Chuck Tucker** spearheaded the efforts to implement changes across the College’s departments.

“There’s a big resurgence of focus in the College about undergrad students and their experience,” Tucker said. “This is one of a number of different things that we’ve been doing to try to improve that.”

In the 2012-13 academic year, MechSE took its first steps down this new educational path by utilizing several high-impact tactics in Introductory Dynamics (TAM 212), one of the department’s large, sophomore-level

lecture classes. MechSE faculty members **Matthew West**, **Elif Ertekin**, **Daniel Tortorelli**, and **Marianna Silva** were among those who planned and taught this inaugural effort.

Their goals were to improve student engagement and enthusiasm, improve the experience and reduce the time commitment for instructors, and maintain the current high level of rigor. To achieve this, they used state-of-the-art pedagogical and technological solutions.

“This is now what they call a blended class,” West said. “The blended model means some of the class happens online and some happens in person, depending what the activity is. Some things work better online: the question-and-answer work. But the group work and team building obviously work better in person.”

Much of the online instruction included full-motion examples of engineering concepts in real-world situations—like the knee-ankle-foot motions taking place while pedaling a bicycle—rather than reading about them in a textbook.

The in-class environment has changed just as much. For the big

lecture hall sessions, iClickers were used in conjunction with the lecture to create an “active-learning” environment. An iClicker is essentially like a TV remote control, which each student uses to choose answers to multiple-choice questions raised by the instructors as they advance through the material. All of the students’ answers are collected wirelessly, and the cumulative totals are shown on the screen at the front of the class.

“Students are actively problem solving,” West said. “As a lecturer, when you go in you’re not completely sure what all you’ll teach in that lecture because it’s driven by what happens when they’re solving these questions. If it turns out that everyone’s answering things really easily, you might speed up and cover more. If nobody can solve anything, you may need to go back and revise the lecture. The students in a way drive the lecture and the material.”

The discussion sections, which each contain about 20 students, were realigned so that the students formed four-person groups to work on assignments instead of working individually. To many of the students, this came as

unwelcome news. But by mid-semester, an overwhelming majority preferred working in groups, and the new structure led to much more deeply integrated peer mentoring.

“We spent a lot of time during the first week explaining that the real world works like this,” West said. “We told them, ‘When you graduate, you’ll depend on other people. Engineers work in teams. Even if you don’t like the other people, you might have to work with them.’”

“By midway through the semester, very few people still wanted to do the work on their own.”

These new methods and technologies have resulted in better time usage for the faculty and teaching assistants. Students are provided a responsive, 24-hour online forum (through Piazza software interface), a transparent and efficient exam system, immediate and individualized exam feedback, and instant access to online lecture material.

Statics (TAM 210/211), Introductory Solid Mechanics (TAM 251), and Mechanical Design I & II (ME 370 & 371) are scheduled to receive a similar makeover in the coming semesters.

In Spring 2013, TAM 212 students worked on assignments in four-person teams much more than previous semesters.





Tucker named UIUC vice provost

MechSE professor **Charles Tucker III**, recently installed as vice provost for undergraduate education and innovation, is well aware of the inherent challenges of producing a high-quality undergraduate experience.

As the associate dean for undergraduate programs in the College of Engineering for the past four years, Tucker worked on a host of initiatives to improve undergraduate education, most aimed at increasing support for underrepresented students, enhancing recruiting practices, encouraging curricular innovation, and upping scholarship offerings.

His familiarity with those themes has made him eager to take on the newly created position.

"I've been working to improve undergraduate education for the last 10 years," he said. "I've always loved being in the classroom and more recently I've enjoyed contributing to college- and campus-level projects. I've gotten to a place in my career where I want to help on a larger scale. Now, instead of working 'retail' I'm in 'wholesale'—it's undergraduate education broadly."

The call for improving the undergraduate experience has come from the highest levels of the university.

Chancellor **Phyllis M. Wise** has placed accessibility and diversity at the top of her administrative agenda, and University President **Bob Easter** has urged campus leaders to develop nonclassroom offerings to make the campus experience even more enriching.

"There's a desire being expressed to take a thorough look at the undergraduate experience on campus," Tucker said. "**Ilesanmi Adesida** (provost and vice chancellor for academic affairs) has put a high priority on undergraduate education because being great at it is critical to our students and our society; it's important that we have people who are thinking about undergraduate education every day. We owe it to our students to deliver value."

Tucker said one of the most interesting challenges facing the university is the rapidly changing picture of online and electronic learning—and understanding how those tools can best be used for on-campus teaching.

"MOOCs (massive open online courses) are exciting because they can greatly extend the reach of the U of I," he said, "but they have also put teaching and learning at the center of the conversation.

"There are many questions our campus will have to grapple with, such as, 'What are the best ways to use the e-learning tools that we have now?' 'What new developments should we support?' 'What aspects of on-campus, in-person education are irreplaceable?'"

In his previous position, Tucker led the development of a regular college-wide survey that assesses the climate for students and measures program impact on a student's experience.

"It's given us good, quantitative information," he said, "and as it's been said, the plural of anecdote is not data."

He said he also is committed to the ideals of accessibility and affordability in higher education.

"The vision for a land grant institution is that it's an opportunity for everyone," he said. "Anyone with talent and commitment—we want that person to have a chance to come here and to succeed."

opportunities in either industry or graduate school after graduation."

With such a highly rated undergraduate program—No. 5 in the latest *U.S. News & World Report* rankings—the department continues to gain enhanced recognition for the caliber of the curriculum and the students. Christensen sees some key ways to keep the program's momentum moving forward.

"I would like to develop more robust computational aspects to our curriculum, ideally a coherent pathway of computational experiences throughout both the ME and EM curricula, that will place our graduates at the forefront of these important techniques," he said. "I would also like to continue growing the base of research opportunities available for our undergraduate students to enhance their critical-thinking skills while providing them with the experiences necessary to successfully compete for top-tier graduate fellowship

opportunities upon graduation."

Since he already filled a MechSE administrative role, Christensen took on his new position already knowing the department's undergraduate students were an extremely intelligent group dedicated to their education. But he has been pleasantly surprised by the students' passion for making a broader impact on society through their activities.

"We have many student groups pursuing outreach activities in our local community and public schools, for example, to enhance the interests of the next generation in engineering," Christensen said. "We also have students active in Engineers Without Borders, tackling technological challenges unique to impoverished countries.

"So I am continually amazed and impressed with the diverse range of important and impactful activities our students become involved in well beyond their classroom education. I think it is fantastic!"



Christensen takes undergrad leadership role

Beginning in Spring 2013, Professor **Kenneth Christensen** (PhD TAM '01) took on the position of Associate Head for Undergraduate Programs. Already serving as the Associate Head for Mechanics Programs, Christensen now fills a large and important leadership role in the MechSE Department.

And while he sees challenges for the department, he emphasizes that MechSE currently holds a strong position and an even brighter future.

"Our enrollments continue to grow owing to continued popularity of both the EM and ME degree programs," Christensen said. "I think students realize early on that the fields of mechanical engineering and engineering mechanics provide them with the most diverse training among the various engineering majors. This diverse education gives our students enhanced flexibility and agility to move on to a very broad range of oppor-

Faculty News



Narayana Aluru has received funding from the College of Engineering's Strategic Instructional Initiatives

Program (SIIP) for computational applications for an integrated undergraduate simulation environment.



Armand Beaudoin has received SIIP funding from the College of Engineering for ME 370 & 371 (Machine Design I & II).



Joseph Bentsman has received SIIP funding from the College of Engineering for improving education

through integrated modeling, signal processing, instrumentation, and control approach.



Kenneth Christensen has been named MechSE's Associate Head for Undergraduate Programs

(see page 20).



Harry Dankowicz has received the Fred Merryfield Design Award from the American Society for Engineering Education (ASEE). He has received an INSPIRE Award (Integrated NSF Support Promoting Interdisciplinary Research and Education) from the National Science Foundation. He also has received SIIP funding from the College of Engineering for improving education through integrated modeling, signal processing, instrumentation, and control approach.

"We have many student groups pursuing outreach activities in our local community and public schools, for example, to enhance the interests of the next generation in engineering," Christensen said. "We also have students active in Engineers Without Borders, tackling technological challenges unique to impoverished countries.

"So I am continually amazed and impressed with the diverse range of important and impactful activities our students become involved in well beyond their classroom education. I think it is fantastic!"



Geir Dullerud has received SIIP funding from the College of Engineering for IT methods and leverag-

ing big data.



Randy Ewoldt has been named Distinguished Young Rheologist by TA Instruments.

He received the Gold Medal for outstanding achievements in mechanical engineering within 10 years of graduation from ASME / Pi Tau Sigma. He also has received an American Chemical Society (ACS) Petroleum Research Fund (PRF) Doctoral New Investigator Award.



Placid Ferreira has been named a Fellow of the American Society of Mechanical Engineers (ASME).



Jon Freund has received the Engineering Council Award for Outstanding Advising from the College of

Engineering.



Naira Hovakimyan has received SIIP funding from the College of Engineering for improving education through integrated modeling, signal processing, instrumentation, and control approach.



Sascha Hilgenfeldt has received the Engineering Council Award for Outstanding Advising from the College of Engineering.



Elizabeth Hsiao-Weckslar has received the Dean's Award for Excellence in Research. She

has received a College of Engineer-

ing Willett Faculty Scholar Award. She also has received SIIP funding from the College of Engineering for ME 370 & 371 (Mechanical Design I & II).



Emad Jassim has received the MechSE Alumni 5-Year Effective Teaching Award and the Campus

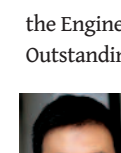
Excellence in Undergraduate Advising Award.



William King has received the Gustus Larson Memorial Award for outstanding achievements in mechanical engineering within 20 years of graduation from ASME / Pi Tau Sigma.



Dimitrios Kyritsis has received the MechSE Alumni 2-Year Effective Teaching Award.



He also has received the Engineering Council Award for Outstanding Advising.



SungWoo Nam has received the Engineering Council Award for Outstanding Advising. He also has received an American Chemical Society (ACS) Petroleum Research Fund (PRF) Doctoral New Investigator Award.



Martin Ostoja-Starzewski has been named to the Executive Committee of the International Society for the Interaction of Mechanics and Mathematics (ISIMM).



Michael Philpott has received the Engineering Council Award for Outstanding Advising.



Srinivasa Salapaka has received the Engineering Council Award for Outstanding Advising. He also has

received SIIP funding from the College of Engineering for improving education through integrated modeling, signal processing, instrumentation, and control approach.



Huseyin Sehitoglu has been named a Fellow of ASM International (formerly the American Society for Metals).



Kimani Toussaint has received a promotion to associate professor. He has also received SIIP funding from the

College of Engineering for improving education through integrated modeling, signal processing, instrumentation, and control approach.



Chuck Tucker has been chosen to be the Vice Provost for Undergraduate Education and Innovation for the University of Illinois (see page 20).



Pratap Vanka has received SIIP funding from the College of Engineering for computational applications for an integrated undergraduate simulation environment.



Amy Wagoner Johnson has received the Campus Excellence in Guiding Undergraduate Research Award.



Matthew West has received SIIP funding from the College of Engineering for IT methods and leverag-

ing big data.



High school girls to build machines in new MechSE summer camp

In July 2013, MechSE will be offering a new camp variation designed for up-and-coming female engineers: Girls Building Awesome Machines (G-BAM).

Each summer, more than 100 high school girls come to the University of Illinois to attend GAMES Camp (Girls Adventures in Mathematics, Engineering, and Science). The camp, sponsored by Women In Engineering (WIE), is meant to give academically talented high school girls real engineering experience in a university setting, while encouraging them to enter normally male-dominated STEM fields. The most unique feature of this camp is its “tracks,” which split the program into engineering interests: chemical, biological, environmental, aerospace, electrical, materials, computer science—and now mechanical.

“This will be a weeklong opportunity for high school girls to be exposed to many diverse aspects of mechanical engineering,” said MechSE assistant professor **Elif Ertekin**, who is a co-creator and coordinator of G-BAM along with MechSE associate professor **Matthew West**. “This year, the camp will focus around the theme of wind energy, and over the course of the week we will build, assemble, and test a small wind turbine.”

In the years to come, girls in the G-BAM camp track may work on other projects with a global, humanitarian, or eco-friendly focus, such as building robots to clean up hazardous waste, creating prosthetics, or making water treatment systems that run on sunlight.

“I hope this gives the participants a better appreciation and understanding of what it is that we, as mechanical engineers, do,” Ertekin said. “I also hope that helps to illustrate that mechanical engineering has a large role to play in addressing the critical global and societal issues that we face.”



Jassim receives Excellence in Undergraduate Advising Award

Dr. **Emad Jassim** (BSME '99, MSME '01, PhDME '06), MechSE's Director of Undergraduate Programs, has received the 2013 Excellence in Undergraduate Advising award from the University.

Every year, campus-level awards for excellence in instruction are given by the Office of the Provost. The Excellence in Undergraduate Advising award is given to a candidate who has sustained excellence in undergraduate advising and has had a major impact on undergraduate students and their intellectual development through sustained academic advising relationships.

After earning his PhD, Jassim became involved in the department as a visiting research professor, during which time he advised graduate students. For almost seven years, he has been a senior design project coordinator and lecturer. He advised undergraduate students on their projects for their senior design course and their plans after graduation long before he joined the undergraduate programs office. He has now served as Director of Undergraduate Programs and Chief Advisor for three years.

“When I came to the undergraduate programs office, advising was one of the things I continued to do along with being involved in the senior design course,” Jassim said. “I also teach. So I wear a lot of hats in this office, and I seem to be wearing more as every year progresses.”



Muskin wins national education award

MechSE's **Joseph Muskin**, educational coordinator at the Nano-CEMMS Center, was recently awarded the NSTA's Distinguished Informal Science Educator Award for extraordinary contributions to the advancement of science education in a nontraditional setting.

“It always feels great when one is recognized for their hard work, but this truly was a shared award with all the wonderful faculty, fellow co-workers, and students who have contributed so much to the education program here,” Muskin said.

Muskin was nominated by **Tara Bell**, a STEM Specialist at Booker T. Washington STEM Academy in Champaign. The school is one of many in the area that Muskin has visited on behalf of Nano-CEMMS, giving demonstrations with 3-dimensional printers, polymers, scanning electron microscopes, and more. In addition to giving demonstrations to students, he also gives workshops and seminars for teachers so that they can do nanoscience-related experiments on their own.

“I remember when we first started all those years ago, we were excited to be invited to one school, and we had only four teachers attend our first workshop,” Muskin said. “Now we are out in a school several times a week, and our teacher workshops fill every summer, with over several hundred having attended over the last few years. What a long way we have come.”

Muskin has presented in hundreds of afterschool and weekend science programs for students of all ages, well over 20,000 participants. He has presented over 70 times at education and science conferences and has authored or coauthored seven publications about science education. He is also a board member and an education committee member at the Orpheum Children's Science Museum in Champaign and recently trained and supplied their staff to conduct “science nights” at 10 local elementary schools. Once the Nano-CEMMS Center closes in August 2013, Muskin will take on a broader role as outreach coordinator for MechSE.

Message from the Advancement and Communications Office



Dear Alumni & Friends:

My first six months in the Advancement Office have been a whirlwind, as I learn the full scope and breadth of this office. I am continually overwhelmed by the generosity of our alumni and friends. I would like to call attention, in particular, to Mr. **Sidney Lu**'s \$5 million pledge in honor of his mother (which is a feature article in this publication). This gift will have an impact in perpetuity, and we are extremely grateful to Sidney!

In addition, we have received another significant “in-kind” gift that has had an immediate impact: Hendrick House, which is a private certified dormitory near the Engineering campus, has made a four-year pledge for two full room-and-board scholarships for MechSE freshmen. This gift is a tremendous recruiting incentive for us, and we were able to attract two outstanding freshmen as a result.

A final gift that I would like to note was made in memory of an alumnus who died at a young age. Hillphoenix, Inc. has established a research award in memory of Mr. **David Hinde** (BSME '90, MSME '92), who was their director of research. David died unexpectedly in 2012, and his company has established this fund to honor his memory. It will be used to help fund a graduate student's research in the area of refrigeration systems, which was David's area of expertise. David will be forever missed, but this award will be part of his legacy in the refrigeration industry and in MechSE.

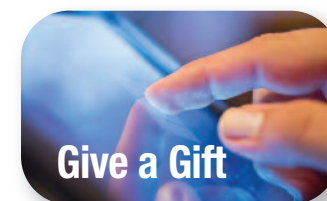
On May 12, we had the distinct pleasure of hosting well over 300 students and their families for our now-traditional graduation brunch. We were proud to welcome back alumna **Jean O'Brien Gibbons** (BSME '82, MSME '85), who shared remarks about what her degrees from Illinois have meant to her career. This group will join the 14,000 other living alumni from Engineering Mechanics, Mechanical Engineering, and Theoretical and Applied Mechanics who are working in all corners of the globe, leading successful careers and having a positive impact on society and our quality of life.

I would like to update you on an item that I mentioned in my last letter. We are excited that the **ME Building Renovation and Addition** project is moving forward. We are in the final stage of retaining an architect and will begin the conceptualization phase this fall. If you are interested in participating in the conceptualization phase, please let me know. Our initial estimate for the capital campaign for the East Wing is in the \$10-20M range, which will be augmented by roughly \$8M in UI funding for the building renovation. I hope you will consider partnering with us in some way, large or small—feel free to give me a call or shoot me an email if you have questions or want to discuss options.

I hope to see many of you soon as I begin traveling in earnest. If you would like me to stop by, please send me a note or call me.

Go Illini!

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



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



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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 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 be assembling this information for future publication.



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



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This year's team made one of the best-looking cars yet, but how would it perform?
Check the Spring 2014 magazine to get all of the Summer 2013 competition results!

