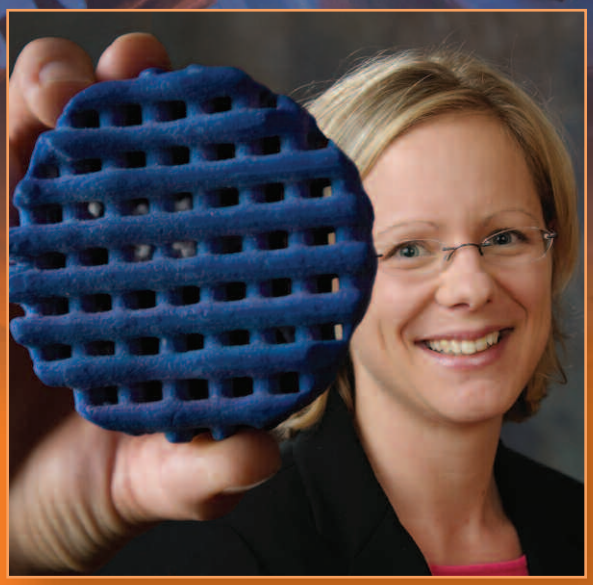
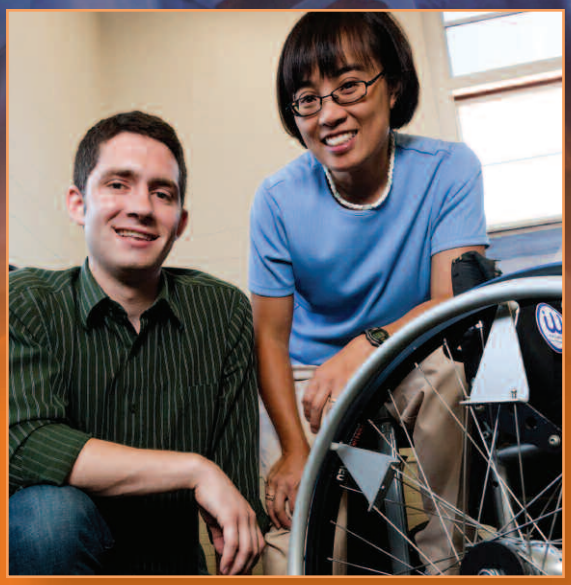
Spring 2012

Mechanical

SCIENCE AND ENGINEERING





Moving the World Forward

ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Contents

Mechanical Science and Engineering

Department Head
Placid Ferreira

Director of Advancement
Chad Rohlfs

Editor
Bill Bowman,
Associate Director of Communications
wbowman@illinois.edu

Writers
Bill Bowman
Kim Cheney
Linda Conway
Rick Kubetz
Kate Leifheit
Jim Phillips
Betsy Powers
Laura Schmitt

Photography
Bill Bowman
Joe Domenico, Sr.
Jason Lindsey
Jim Phillips
Betsy Powers
Brian Stauffer

Designer
Pat Mayer

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From the Department Head

As we find ourselves in the midst of the 2011-12 academic year, it seems busier than usual in the Department of Mechanical Science and Engineering. We have new faces among the students and the faculty alike, new international centers down the hallway, and new associate heads leading our undergraduate and graduate programs. There are new technological breakthroughs, new grants and awards, and an unbelievably impressive new freshman class. We are breaking fresh ground literally every day, and things have never seemed so energized—or so busy!

Some of our most exciting happenings involve two important research centers that have opened recently in our department. One of these, the $25 million National Science Foundation **Center for Emergent Behaviors in Integrated Cellular Systems (EBICS)**, involves MechSE professors **Jimmy Hsia** as associate director and **Taher Saif** as a research leader. EBICS creates sensors, processors, and actuators from living cell clusters and assembles them to produce different capabilities that can address health, security, and environmental issues. This could open up a completely new research field and have incredible implications for medicine and biology. The department's second new center is a part of the $160 million **International Institute for Carbon-Neutral Energy Research**, called **I²CNER** (pronounced "Icener"). We are proud that MechSE professor and associate head for mechanics programs **Petros Sofronis** is the director of both the Illinois research and the overall institute. With its main headquarters located at Kyushu University in Fukuoka, Japan, I²CNER was established to develop the science behind a carbon-neutral energy economy.

Energy has emerged as one of the key research areas in mechanical engineering and engineering mechanics, and many MechSE faculty and multiple centers are now involved in energy research. In addition, the department now offers an MSME Degree with Certificate in Energy Systems Engineering. The program is designed to serve students seeking a post-graduate degree and enhanced preparation for a career in the growing field of energy engineering. It will provide mechanical engineers with intense and accelerated exposure to the science and engineering that forms the basis of energy systems, plus an integrative project experience to enable independent research, development, and design skills. Graduates from this program will be qualified to work for companies currently addressing the many problems of providing affordable and sustainable energy solutions.

MechSE has three new faculty members, **Elif Ertekin**, **Randy Ewoldt**, and **Seok Kim**, who count energy research among their specialties. While you will read more about them in the faculty section of this magazine, I would like to point out how proud we are to have attracted such stellar talents to Illinois. And the department's growth will not stop there, as we will be searching for more early-career, tenure-track faculty for 2012-13 as well. Professor **William King**, the chair of our faculty recruiting committee, will be seeking the best and brightest candidates who possess great energy and a passion for new technologies and research areas, as we plan to grow our faculty size to address the increasing demand for mechanical engineering.

Indeed, our vision for the future includes combining mechanical science and engineering with other disciplines in new and novel ways. Just in the pages of this magazine, you can read about Professor King's huge contributions to modern manufacturing through nano-technology and Professor **Amy Wagoner Johnson**'s utilization of mechanical technology in healing severe breaks in human bones. It is this type of ingenuity and imagination we strive to stir up in MechSE students as well. Our Eco-marathon student team even brought home a first-place trophy from the 2011 Eco-marathon international competition, after notching 871 miles per gallon with a car running on ethanol in the alternative energy category.

The department is fortunate to be in a position to attract undergraduate and graduate students of such caliber that they someday could—and in many instances, will—change the world. To continue bringing in these top students, we need to continue awarding generous scholarships and fellowships, providing state-of-the-art laboratories, and offering opportunities like study-abroad programs, senior design projects, and other real-world experiences. Our facilities soon will need an improvement in order for us to remain among the elite and most sought-after programs in the world. Your past support is greatly appreciated and has gotten us to the strong position we are currently in, and we hope to receive your continued support as well. It is an investment that pays handsomely, both in the improved outlook for the department, faculty, and students, and in the value of the degree you received. A degree from the Department of Mechanical Science and Engineering at Illinois holds incredible value throughout the world, and we look forward to that value only increasing in the future.

With best regards,

Placid Ferreira
Department Head
Grayce Wicall Gauthier Professor

New center advancing toward **cellular machines**

Imagine if there was a patch that diabetics could wear on their skin that automatically detected glucose levels, produced insulin, and released insulin into the bloodstream when needed. For the 18 million Americans diagnosed with diabetes, the patch would be a life-changing miracle. No more needle pricks six or more times a day to test blood sugar levels, no more insulin injections, no more risk of dangerous blood sugar reactions.

Or, imagine microfluidic machines that mimic the behavior of human organs and serve as testbeds for potential disease-curing drugs. The machines could take the drugs, allowing scientists to monitor the drugs' effectiveness without having to go through expensive and time-consuming animal trials.

Although this patch and drug-screening machine may still be years away, researchers at the University of Illinois, MIT, and Georgia Tech are developing the fundamental science required to make these and other biological machines a reality. The researchers are part of the $25 million **National Science Foundation Center for Emergent Behaviors in Integrated Cellular Systems (EBICS)**, which is creating sensors, processors, and actuators from living cell clusters and assembling them to produce different capabilities that can address health, security, and environmental issues.

"The machines will be built from living cells and they can have their own objectives, but the key thing is they must be able to sense, actuate, and learn," said MechSE professor and EBICS researcher **Taher Saif**.

"If successful, we will open up an entirely new field of research with wide-ranging implications, ranging from regenerative medicine to developmental biology," said **Roger Kamm**, EBICS director and MIT mechanical engineering professor.

Illinois MechSE professor **K. Jimmy Hsia**, who serves as EBICS associate director, noted that the center's focus on living cell clusters is a nascent research field.

"Biologists are either studying individual cells—how they move, what kind of environment would change cell behavior or differentiation—or they are studying whole animals, such as mice, to study many phenomenon," Hsia said. "Very few people are actually studying the critical mass of cells that have so-called emergent behavior. We want to find out when individual cells forming into clusters become functional and what functionality can emerge from that collection of cells."

EBICS research is organized around six research themes: the development of machine components made of muscle, neuronal, and endothelial cells derived from stem cells; engineered interactions among cell clusters; directed and emergent 3-D multicellular structures with controlled microenvironments; engineered machines with sensing, processing, and release functions for neurotoxin annihilation; the development of autonomous bio-bots using 3D stereolithography and hydrogels; and the development of cellular machines for glucose biosensing and insulin release.

Saif is leading the research theme on engineered interactions among cell clusters. According to Saif, the main goal of this theme is to understand what parameters are required to guide neurons, muscles, and epithelial cells to form a coherent structure that can self-sufficiently provide nutrition and actuate in cells.

"We believe the mechano-micro environment has a huge role to play," Saif said. "We're looking to see if we can create a variation of the mechanical hardness or softness in the environment as a way to guide the movement of neurons in the right direction."

Underlying each research theme is the development of enabling technologies that provide EBICS researchers with micronanotechnology, simulation, and imaging tools to carry out their work. According to Hsia, a novel cell mass and growth measurement system that he developed with EBICS colleague **Rashid Bashir**, an Illinois MechSE affiliate professor, may help researchers in the cell-cell interaction theme answer some fundamental biology questions.

Their cell measurement system incorporates MEMS resonant mass sensors into a square-shaped platform with four springs; it can directly measure both mass and growth rate of single adherent cells, which is a fundamental biological process known as the mitosis cycle.

While no one can predict how long it will take to develop biological machines, Hsia is fairly confident that EBICS researchers will have created several simple machines within the next five years. He also foresees pharmaceutical and medical product companies to be among the first industries to take an interest in EBICS results.

MechSE professors Taher Saif and Jimmy Hsia with the rest of the EBICS team.

Clean energy

the driving force behind Illinois-Japan research center

The University of Illinois has established a new research center on campus to develop the fundamental science required for a carbon-neutral energy economy. The center is part of the $160 million **International Institute for Carbon-Neutral Energy Research (I²CNER**, pronounced "Ice-ner") located at Kyushu University in Fukuoka, Japan.

"Our research is basic science but it is issue-driven rather than curiosity-driven," said MechSE professor **Petros Sofronis**, who directs both the Illinois research and the overall Institute. "The Institute will advance the science necessary to both establish a non-fossil-based energy carrier system and contribute to the reduction of carbon-dioxide emissions."

One of the objectives of I²CNER is to explore ways to produce, store, and distribute hydrogen. In particular, I²CNER researchers **Andrew Gewirth** from Chemistry and **Lane Martin** and **Angus Rockett** from Materials Science and Engineering will focus on artificial photosynthesis as a means of creating hydrogen using the energy of the sun. Researchers will also explore using this hydrogen in next-generation hydrogen fuel cells for automobiles.

Hydrogen-powered fuel cell cars exist, but they are extremely expensive, in part, because the fuel cells are made with the costly metal platinum. I²CNER researchers including **Thomas Rauchfuss** from Chemistry will work to discover new materials to replace platinum as the catalyst that drives reactions inside the fuel cell and to improve overall fuel cell efficiency.

Illinois and Kyushu faculty will address organic and inorganic semiconductor materials and corresponding interfaces to find more efficient ways to produce hydrogen, including using solar cells to capture sunlight and electrolyze water.

Working with **Brian Somerday** of Sandia National Laboratories and Berkeley professor **Rob Ritchie**, Illinois Materials Science professor **Ian Robertson**, Sofronis, and Kyushu professor **Yukitaka Murakami** will investigate the compatibility of hydrogen with structural materials for the building of the hydrogen distribution infrastructure, e.g. pipeline systems and dispensers at fuel cell stations.

In addition to research directed at enabling the hydrogen economy, I²CNER research will explore ways to reduce CO_2 emissions by focusing on methods to efficiently capture and store CO_2 from an array of sources, such as manufacturing and power plants. Researchers including **Paul Kenis** from Chemical and Biomolecular Engineering will focus on turning this CO_2 into a useful product. One research theme will explore new ways of separating CO_2 from other exhaust gases. Other research themes will explore how to safely store the CO_2 underground or under sub-seabed geological strata.

According to Sofronis, researchers at Illinois are well positioned to address the CO_2 sequestration issue, in part, due to the efforts of the Midwestern Geological Sequestration Consortium—directed by **Robert Finley**, with assistant director **Sallie Greenberg**—which is conducting a large-scale operation to confirm that CO_2 emissions (1 million tons/year) can be stored permanently in deep saline sandstone rock formations. In that study, engineers liquefy and compress CO_2—a byproduct of the Archer Daniels Midland Company's ethanol plant—and inject it into deep (about 2.1 km) underground wells near Decatur, IL, where it will be stored in porous rock for millions of years. The work of MechSE associate professor **Dimitrios Kyritsis** focuses on determining the structure of CO_2 flows in the high-pressure, low-temperature regime that is relevant to CO_2 sequestration and capture.


Petros Sofronis

"I²CNER researchers will also look at how the liquid CO_2 interacts with the water in the porous rock," Sofronis said, noting that Materials Science professor **David Cahill** will investigate the properties of supercritical CO_2. "We want to avoid fracturing the porous rock because then the CO_2 may escape. This is a fundamental science problem—a wonderful example of using mechanics against fracture and material deformation instability."

Another fundamental science problem is understanding how the CO_2 in the oceans and the atmosphere interacts with the ocean turbulence and the ocean surfaces. MechSE associate professor and I²CNER satellite office associate director **Kenneth Christensen**, an expert in the area of turbulent flows and on the effects of roughness on the flow of fluids around surfaces, will be studying these fluid mechanics issues. MechSE professor **Arne Pearlstein** is contributing research focusing on the development of computational tools that can be used to assess the dissolution of CO_2 drops into the ocean. Such tools are of paramount importance for assessing the risk of various approaches to sub-seabed storage.

There will be an intensive program of faculty and student exchange between Illinois and Kyushu University that will expand the international visibility of both institutions. According to Sofronis, Illinois has been a world leader in hydrogen materials compatibility research for more than 30 years largely because of continuous support from the U. S. Department of Energy.

To enable this technology development, I²CNER scientists and engineers will partner with industry. Already, they are collaborating with researchers at ExxonMobil Research Company in Clinton, NJ, on hydrogen/materials compatibility issues.

The Illinois Eco-marathon team, along with "Blue Lightning" and "Orange Thunder," await the start of the 2011 Eco-marathon.

Illinois' 871 mpg good for 1st place at international event

"I magine driving from Champaign to New York on one tank of ethanol that was produced by using ten-by-ten square feet of grown corn," said MechSE professor **Michael Philpott,** the adviser of the Eco-marathon team.

The 2011 Eco-marathon team's Blue Lightning car attained 871 miles per gallon in fuel efficiency, which roughly equates to the distance from Champaign to New York—on just one gallon of fuel! The team won 1st place with a 100% ethanol engine car in the alternative energy category and 10th place overall at the Eco-marathon competition, which took place in downtown Houston, Texas.

"Coming from a corn state, I think that is pretty cool," Philpott said.

"THE LAST MONTH, WE ALL JUST KIND OF CAMPED OUT IN THE SHOP EVERY DAY AS WE TRIED TO GET EVERYTHING TOGETHER. I FEEL LIKE WE ALL JUST GOT TO KNOW EACH OTHER BETTER, WHICH MADE IT GOOD WHEN WE GOT DOWN TO COMPETITION."
– TEAM MEMBER MARK HAUGHEY

The team's second car, Orange Thunder, finished 8th in the unleaded gas category and also in the overall competition. The car consumed unleaded gas at approximately 900 miles per gallon.

The rankings are determined by calculating the highest equivalent to miles per gallon of each car. Competing cars ran on fuels including unleaded gas, electricity, solar power, ethanol, diesel, and more. Each car had 24 minutes and 15 seconds to complete six miles on a track in downtown Houston, potholes and all, and demanded that a car must travel an average of at least 15 miles per hour and carry at least 100 pounds in order to qualify for a standing.

This is the fifth year the Shell Eco-marathon occurred in America. It started as a friendly event between researchers in 1939 to see which car could get the most miles per gallon. It became a competitive event in 1985 in France, an event that attracted students and scientists. Philpott said the long-range goal is to design a car that will travel 3,000 miles, about the distance of New York to Los Angeles, on an equivalent of one liter of fuel.

This is just the second year a team from the University of Illinois competed in the event, and the 11 seniors were able to work together to outpace last year's mileage by about 559 miles per gallon.

"The biggest improvement was our driving strategy," team member **Joseph Domenico** said. Originally, the team did a drive-and-coast method in which the car's speed ranged from 0 to 35 miles per hour. "We found out by watching and talking to other teams that the best strategy was to kind of bump your engine a bunch of times to keep your range between 13 to 18 miles per hour."

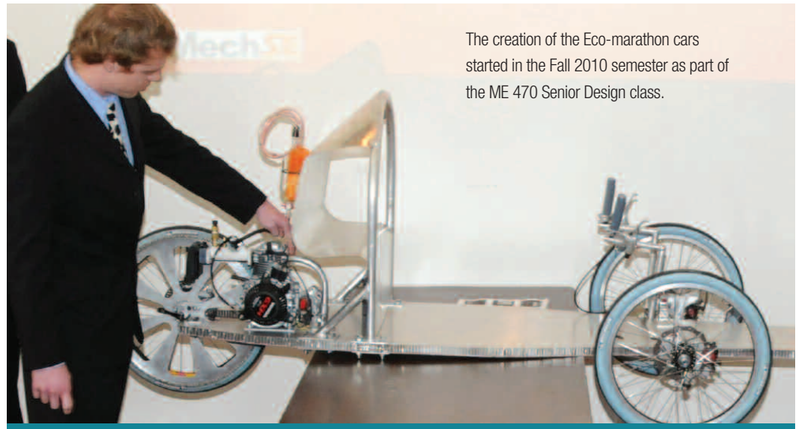
The team focused on two key areas: engine efficiency and rolling friction. A standard Honda 50cc engine was modified for electronic fuel injection (EFI) using a micro-controller to optimize combustion efficiency and air-fuel-ratio via O_2 sensors, engine RPM, and road-speed monitoring. To minimize rolling friction losses, the students carefully designed the steering mechanism with camber, caster, and Ackerman angle working together to minimize tire scrubbing. They also utilized E2, energy-efficient, ceramic cage wheel bearings; a single-stage chain-drive train system; and high tire pressures mapped to the prevailing road surface conditions.

"IT WAS REALLY SATISFYING WHEN WE ACTUALLY GOT THERE AND BOTH OUR CARS WERE ON STANDS READY TO GO AND EVERYBODY ELSE HAD THEIR TABLE GRINDERS OUT STILL TRYING TO FINISH. WE HAD A SOLID RUN."
–TEAM MEMBER BROCK POLLMANN

"Our car was pretty unique," team member **Brock Pollmann** said. "We made an aluminum skeleton out of rods and then stretched spandex over it and then used fabric stiffener and paint to harden it up and it worked pretty well."

Each team member worked an average of 15 hours per week on the cars, which increased to 30 to 40 hours during the last three weeks before the competition. In 2012, the team hopes to get underclassmen involved so the club has students working on the car for four years, accumulating more knowledge and keeping more expertise in the club from year to year.

"If you have kids working on it for four years, then they can get a lot more experience and be one of the top competitors in more than one [Eco-marathon] category," Domenico said.



The creation of the Eco-marathon cars started in the Fall 2010 semester as part of the ME 470 Senior Design class.

ME 470 – Senior Design Class

The "Blue Lightning" and "Orange Thunder" cars were both developed as part of the Senior Design class, or ME 470. As shown in the photo above, the cars had not reached their final competition form during the Fall 2010 session, but the underlying mechanics were taking shape nicely.

For the Spring 2011 Senior Design competition, not only had the cars been completed, but they had already competed in the Eco-marathon event in Houston. A first-place finish in an international competition did nothing to hurt the team's performance in the Senior Design competition either; the team took first place in the Spring 2011 Senior Design session.

"There are really just a ton of impressive projects here and some incredible work has been done by these students," one of the senior design judges said. "But as judges, one of the things we have to look at is not only was the work top-notch, but was it completed 100% so it's ready to package and ship.

"Getting first place in the Eco-marathon says a lot. Now that's a finished product."

Student's prize-winning invention

rolling toward market introduction

"People who need wheelchairs face a lot of problems that others do not on a day-to-day basis. For example, pushing a wheelchair up and down hills can have huge wear on your shoulders."

– Scott Daigle

It was almost two years after the first prototype when MechSE graduate student **Scott Daigle** heard the successful sound of gears shifting while pushing a wheelchair up and down an open hallway. Daigle breathed a sigh of relief and felt a growing excitement. The IntelliWheels automatic gear shifting system worked.

In March 2011, Daigle won the $30,000 Lemelson-MIT Illinois Student Prize, which is administered by the Technology Entrepreneur Center. The ceremony was telecasted with three other universities (MIT, Caltech, and Rensselaer) and was held in the National Center for Supercomputing Applications Auditorium.

Daigle's invention of the IntelliWheels automatic gear shifting system improves the basic health of wheelchair users. According to Daigle, there are 2.2 million wheelchair users in America and 73% of them develop shoulder pain.

"People who need wheelchairs face a lot of problems that others do not on a day-to-day basis," Daigle said. "For example, pushing a wheelchair up and down hills can have huge wear on your shoulders."

Even though it takes a physical toll, a lot of wheelchair users still like to use their arms while traveling. The action is a form of exercise for wheelchair users and equivalent to walking.

The IntelliWheels automatic gear shifting system eliminates some of the strain and difficulties wheelchair users experience from traveling daily. The automatic gear shifting system has sensors on the bottom of the wheelchair so that when a wheelchair moves it analyzes three parameters: speed, tilt, and torque. A microcontroller system then selects and shifts to the best gear for wheelchair users when they encounter changes in their environment, such as an uphill or downhill slope. It is a similar concept to when people switch gears on their bicycles.

Graduate student Scott Daigle and associate professor Liz Hsiao-Wecksler exhibit an advanced prototype of the IntelliWheels wheelchair.

As an undergraduate senior in mechanical engineering at Illinois, Daigle brought his idea to MechSE professor **Elizabeth Hsiao-Wecksler**. Hsiao-Wecksler became his co-adviser with Kinesiology and Community Health professor **Jacob Sosnoff**. Both of his undergraduate advisers cofounded IntelliWheels, Inc. with Daigle, who now has MechSE professor **Michael Philpott** as his faculty adviser for his master's thesis.

"I like the drive he has to make the design function," Hsiao-Wecksler said. "He has tremendous focus and vision."

It was these qualities in Daigle that enabled him to form IntelliWheels, Inc. Before graduate school even started, Daigle made a 50-pound prototype with the support of TEC professor **Brian Lilly**. It failed to work, but he continued to move forward. He visited the Division of Rehabilitation-Education (DRES) weekly to learn about the needs and wants of wheelchair users. According to his research and conversations, wheelchair users desire a system that is attachable to their personal wheelchair, is lightweight, and has a low profile.

In the summer of 2010, he worked on a physical transmission design to go inside the wheelchair. By the beginning of the fall semester, he already started building another prototype and went to the mechanical engineering machine shop for help on manufacturing parts.

Throughout graduate school, Daigle had to go through the tedious process of searching for his own funding. He did this early on by competing in business competitions. Daigle and his partners, **Marissa Siebel** and **Jean Samson**, won second place in the Cozad New Venture Competition. The money they won from the prize allowed them to continue work on their prototype as well as start their company.

"We heard our names and the giant cash prize next to it and we were so ecstatic and so amazed that people believed in us like that," Daigle said.

Later, they received a grant from the National Collegiate Inventors and Innovators Alliance (NCIIA) for $20,000. By searching for funding, Daigle said he learned how important it is to present his ideas well and to have confidence in his ideas even before having a tangible prototype. His previous advisers, Hsiao-Wecksler and Sosnoff, encouraged him greatly through the process.

"They helped me find funding. They helped me figure out what we are going to design next, and they helped me figure out how we are going to test it," Daigle said. "I don't think I could have ever done it without the two of them."

Becky Daigle, Scott Daigle's mother and a physical therapist, also noticed the great impact the University of Illinois has had on helping her son achieve his goals.

"The university has just been a great place for him," she said. "They helped him start a business with legal support, office support, and his advisers have been wonderfully supportive in his lab."

Daigle acknowledged the wonderful support of his mother and his sister's great help with editing proposals and reports. His father passed away about five years ago, but Daigle still reminisces on the times when they did home improvement projects, and he is thankful for the innovative characteristics his father instilled in him.

Now, Daigle has $30,000 from the Lemelson-MIT Prize, and he plans to use a lot of that money to help the company commercialize its products.

"When I say commercialize, I mean trying to distribute it and get it to the people that need it," Daigle said, explaining that the most sustainable way to do that was by starting a company. The company seeks new ideas to create more products that will benefit the wheelchair community. One product they made is a spare tire kit that is small and attachable to a wheelchair with color-coded instructions because of how often wheelchair users get stranded without easy access to the right tools. They are also working on the development of caster-skis to help wheelchairs travel through the snow.

The next step for IntelliWheels is usability testing, which will entail wheelchair users trying out the automatic gear shifting wheelchair in a simulated real-world environment and on different types of terrain. After the usability testing, the company will run the device with a special testing rig for 40 days and 40 nights. This will simulate three years of use because the average wheelchair user buys a new wheelchair every 3-5 years. This will also test the design quality for handling the rigors of everyday life. Daigle predicts the conclusion of the next steps will take approximately 18 months, including the building of the third prototype that he hopes will be polished, new, and ready for use.

Anyone interested in learning more about IntelliWheels, Inc. can visit the company's website at **www.intelli-wheels.com**.

Scholarships, Fellowships, and Honors

Scholarships and fellowships are an important way for MechSE to attract top students. Listed below are the recipients of the MechSE scholarships and fellowships for 2010-11 and 2011-12. We congratulate these students and would like to express our thanks to the alumni and friends who made these honors possible.

MechSE Endowed Scholarships

James W. Ashbrook Scholarship
Andrew Jacobs
Saichaitanya Kalidindi

A. Richard Ayers Scholarship
Alexander Berry
Kaleb Collier

James and Loretta Bayne Scholarship
William Charvat
Sarah Coady
Shaival Desai
Anne Goering
Lucas Guthrie
Stuart Herndon
Amit Madhukar
Kathryn Neville
Neeraj Ramachandran
William Smith
Cassidy Warning

Paul A. and Edna M. Beckemeyer Scholarship
Ian Berg
James Hum

Thomas J. Breen and Gail Schaller Breen Scholarship
Matthew Carmody

Donald E. Carlson Scholarship
Daniel Borup
Brian Pierce

Bei Tse and May Chao Scholarship
Timothy Garbaciak
Daniel Gualandri
Daniel Kramer
Ann Zuzuly

Guy Richard Collins Engineering Scholarship
Bryce Austell
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Andrew Bell
Mason Blake
Jessica Brown
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Luke Jungles
Andrew Lee
Jarrod Martis
Michael Rouse
Adam Russell
Dale Sormaz
Cassidy Warning
Scott Zacek
Luke Zaczek
Samuel Zschack

Phillip A. Dethloff Scholarship
Kaleb Collier
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Patrick B. and Janet A. Flanagan Scholarship
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A. G. Friederich Memorial Scholarship
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Drake Hislop
John Magerko
Ryan Mott
Matthew Piper
Gregory Wilk

James E. Peters Scholarship
Jill Godman
Nikhil Kapur
Amanda Stowers

Mark E. Prasse Memorial Scholarship
William Gray

Ben Jay Rosenthal Scholarship
Adam Flanders

Sam Sachs Memorial Scholarship
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Anthony Cerqua
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Eleanor and Eugene Wesselman Scholarship
Eleanor Good
Claire Slupski

Steven Kyoon Yun Memorial Scholarship
Zachary Weiner
Gan Quan Wu

MechSE Annual Scholarships

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Ian McNamara
Cameron Stewart

Illinois Mechanical Engineering Scholarship
Deyan Dimov

Marathon Oil Corporation Scholarship
Timothy Ewan

MechSE Alumni Scholarship
Zachary Baker
Michelle Boehm
Robert Born
Gail Butler
Stuart Herndon
Gideon Horberg
Rohan Karmarkar
Kevin Kibler
Scott Kramer
Karen Lipa
Maggie Naden
Adam Rosenbaum
Jessica Simon

MechSE Outstanding Scholarship
Kris Anderson
Shun Jie Joshua Ang
Mark Figge
Anthony Fiorino
James How
Doojoon Jang
Andrew Riegert
Adam Russell
Nicholas Steach
Marco Venturato
James Zhu

MechSE Corporate Scholarships

Caterpillar Scholarship
Timothy Ewan
Quinton Ford
Gabriel Gaeta
Timothy Garbaciak
Daniel Gualandri
Julia Huynh
Nikhil Kapur
Adam Miller
Lee Ann Monaghan
Charles Orozco
Melissa Pearlstein
Alejandro Scholcoff
Jessica Simpson
Amanda Stowers
Michael Teal

ConocoPhillips Scholarship
Elizabeth Bertness
Lauren Klonowski

ExxonMobil Corporation Scholarship
Erik Anderson
Bryce Austell
Elizabeth Bertness
Jixin Chen
Marc Deetjen
Lucas Guthrie
Raymond Turner
Kevin Wallington

Illinois Tool Works Foundation Scholarship
Andrew Banko
Nathan Dostart
Alexander Gui
Matthew Sada
Dennis Sinks
Nicholas Traina

Kaiser Foundation Scholarship
Gabriel Gaeta
Matthew Ledesma
Charles Orozco
Carol Regalbuto
Alejandro Scholcoff

Parker Hannifin Scholarship
Nathan Dostart
Rohan Karmarkar

National Science Foundation Fellowship Winners:
Bruno Azeredo, Elizabeth Jones, Justin Koeln, and Eduardo Torrealba

MechSE Endowed Fellowships

Eugene and Lina Abraham Fellowship
Jonathan Felts
Marc Ghossoub
Matthew Rosenberger
Tarun Sanghi

Pat and Bette Calabrese Fellowship
James Pikul
Justin Vanness

George A. Costello Memorial Fellowship
Anthony Licari
Peter Maginnis
John Sanders

Thomas J. and Virginia Fisher Dolan Fellowship
Raymond Essick
Eduardo Torrealba

C. J. Gauthier Mechanical Science and Engineering Fellowship
Raymond Essick
Lance Kingston
Peter Maginnis

Henry L. Langhaar Fellowship
Maryam Ghazisaeidi
Amanda Jones

Louis J. Larson Fellowship
Sushil Kumar
Reetesh Ranjan

Robert E. Miller Fellowship
James Pikul

MechSE Alumni Teaching and General Fellowship
Jay Carroll
Louis DiBerardino
Amne El Cheikh
Lance Hibbeler
Blake Johnson
Patrick Lynch
William Morgan
Kashif Nawaz
Steffen Peuker
Gustavo Pottker

James E. Peters Fellowship
Tim Deppen
Amanda Jones
Peter Maginnis

Shao Lee Soo Fellowship
Tim Deppen
Carlos Orduno

Stoyke Fellowship
David Buchta
Sushil Kumar

H.C. Ting Fellowship
Eli Lazar
Lance Kingston
Aaron Shinn

College of Engineering Fellowships

Roy S. Carver Fellowship
Natalie Beams

Mavis Fellowship
Melih Eriten
Vikhram Vilasur Swaminatha
Xin Tang

Graduate College Fellowship Board Block Grant Funding
Joseph Fasl
Mei Kuen Hsu
Michael Johnston
Megan Kania
Lance Kingston
Justin Koeln
Sushil Kumar
Matthew Rosenberger
Justin Vanness
Brian Williams
Michael Wineman

SURGE (Support for Under-Represented Groups in Engineering) Fellowship
Amanda Jones
Carlos Orduno
Sarah Mannen
Eduardo Torrealba

National Fellowships

ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) Fellowship
Kashif Nawaz
Feini Zhang

ASME (American Society of Mechanical Engineers) Teaching Fellowship
Neera Jain

Fulbright Fellowship
Berkem Mehmet
Mina Mikhaeel

GEM (National Consortium for Graduate Degrees for Minorities in Engineering and Sciences)
Eric Rivera

NSF's Intergrative Graduate and Research Training Program (IGERT) Program
Samantha Knoll
Xin Tang

NASA (National Aeronautics and Space Administration) Fellowship
Aaron Shinn

SMART (Science, Math and Research for Tranformation) Fellowship
Eli Lazar

International Fellowships

Vietnam Education Foundation Fellowship
Kim Doang Nguyen

Corporate-Sponsored Fellowships

Caterpillar Tsinghua Corporate Fellowship
Jingyu (Kelly) Chen
Fei Ji
Hongwei Zhang

Department of Energy Fellowship
Jonathan Felts
Neera Jain

Exxon Corporate Fellowship
Md Zubaer Hossain
Justin Vanness

Sandia National Laboratories Fellowship
Adam Sawyer
Mike Sena
David Tse

Sargent and Lundy Fellowship
Todd Reedy

Student Honors

The following students were recognized for their outstanding achievements during the 2009-10 and 2010-11 academic years. They received their awards at the MechSE Annual Awards Banquet held at the end of each spring semester.

MechSE Graduate Awards

James O. Smith Memorial Award
William Morgan
Stephanie Ott-Monsivais

Stanley I. Weiss Outstanding Thesis Award
Ben Blaiszik
Vinay Natrajan

MechSE Departmental Awards

Bei Tse & May Chao Award
Matthew Rosenberger
Luke Zaczek

Clarence L. & Harriette Johnson Award
Bryce Austell
Madison Whitt

O. A. Leutwiler Award
Christopher Delaney
Greg Eisenmann
Mark Figge

Fred B. Seely Award
Or Dantsker
Brian Pierce

Marvin C. Stippes Award
Daniel Borup
Brian Pierce

MechSE Interest Area Awards

Caterpillar Award
Carol Regalbuto
Gina Zak

John C. & Elizabeth J. Chato Award in Bioengineering
Ian Berg
Mei Kuen Hsu

A. G. Friederich Memorial Award
Or Dantsker
David Schmidt

George W. Harper Award
Prashant Jayaraman
Michael Leick
Kathryn Svoboda

Helmut H. Korst Award
Oleg Baryshnikov
Thomas Connelly

Materials Processing Award
Andrew Banko
Dale R. Magliola

T. A. Peebles Award
Kawa Cheung
Gerardo DeLa Torre

T & AM Merit Award
Adam Booher
Elizabeth Jones
Daniel Maynard

Kenneth J. Trigger Award
Bruno Azeredo
Mark Coticchio
James Zhu

MechSE Student Society Awards

Konzo/ASHRAE Engineers Award
Anthony Fiorino
Matthew Marek

ASME Junior Leadership Award
Mark Figge
Valeria Laguna

Patrick B. & Janet A. Flanagan ASME Senior Leadership Award
Carol Regalbuto
Gina Zak

Pi Tau Sigma Sophomore Award
Erik Anderson
James How

James W. Bayne Award for Outstanding Senior in Pi Tau Sigma
Steven Pelech
Stephan Suhar

GM/Philip W. Leistra Jr. Society of Automotive Engineers Award
Michael Kawka
Damian Sokolowski

Leonard Fieman Student Research Award
Daniel Kramer

College of Engineering Awards

Andrea J. Culumber Award
Brian Roehl

Engineering Council Outstanding Student Award
Eric Gobst

William R. Schowalter Award
Eric Gobst

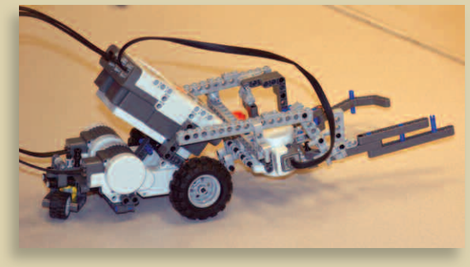
C. S. Larson Transfer Student Award
Kyle Nagy

Knights of St. Patrick
Adam Booher
Douglas Litteken
Brian Roehl
Andrew Zwicky

University Honors

Bronze Tablet
William Brey
Kawa Cheung
Tim Deppen
Greg Eisenmann
Justin Galbraith
Mei Kuen Hsu
Tung Yuen Lau
Scott Leithem
Tyler Leman
Jeffrey Peters
Brian Pierce
Eric Reilly
Matthew Rosenberger
Zachary Schramm
Kevin Wallington
Reginald Weece
Gina Zak

LEGO-bots invade Engineering 100



Clockwise from top:
Freshman MechSE students, faculty, and others crowded around to see the very entertaining competition.

Some of the LEGO-bots, like this one, utilized a pinching mechanism for ball retrieval.

The champion team from one of the Engineering 100 sessions consisted of freshmen Albert M. Xiao, Hriday Bhalaria, Avantika Mohapatra, and Erin Ostojic.

For the Fall 2011 incoming MechSE freshmen, Engineering 100 was a mix of engineering and flat-out fun. For the first time, the students built remote-controlled robots constructed of Legos—"LEGO-bots"—as the hands-on portion of the four-week course.

"It worked out really well," said **Stanley Chang**, lead engineering learning assistant for this year's Engineering 100. "Because they've played with LEGOs before, we knew it'd be easy enough to do, but also it'd be hands on."

One class session per week was dedicated to building the LEGO-bots, with students working in teams to construct the robots from LEGO Mindstorm NXT kits, with their own android smart phones serving as the remote controls. Many of the freshmen did not limit their work time to class, and the Senior Design Lab often had groups of students working to customize their LEGO-bots during their free time.

"My students loved the robot project!" said engineering learning assistant **Ann Zuzuly**. "They wanted the entire class to be longer just so they could fit more robot-building into it. Multiple students said they wanted to go into robotics because of this project."

On the final day of the class, a contest was held that entailed four LEGO-bots at a time competing against each other in a race to gather up balls and place them in the team's designated corner. Each team's entry was unique, as they took different strategies toward what would make the most effective ball-gathering mechanism.

"I thought we'd end up with a lot of robots that looked the same, because the manual provided instructions on how to build one specific robot," Chang said. "But the robots all came out very different. There was a ton of creativity from the kids; it really surprised me."

Engineering 100 is a required course for all freshmen engineering majors at the University of Illinois. It gives a broad overview of topics that can help students become familiar with campus resources, resumes, internships, and other topics that can lead to a successful undergraduate career and beyond.

More than 200 freshmen were enrolled in the 13 MechSE sessions of Engineering 100.

Three new alumni board members named in 2011

New alumni board members John Sutherland, Jean Gibbons, and Thomas J. Donovan.

John Sutherland

As the head of Purdue's nascent Environmental and Ecological Engineering Division, **John Sutherland** (B.S. Industrial Engineering '80, M.S. Industrial Engineering '82, Ph.D. Mechanical Engineering '87) understands the challenges facing top-tier engineering schools.

"Trying to figure out how to excel in an era when support for state universities is flat or declining is an issue everywhere, including Illinois," said Sutherland. "Yes, there are financial challenges, but we also recognize we must constantly strive to improve ourselves."

Sutherland said he is impressed with MechSE's many initiatives, including the new one-year master's degree program with certificate. This new degree serves mechanical engineers who want an advanced degree and enhanced preparation for a career in Energy Systems or Micro and Nano Systems Engineering.

Sutherland pointed out that he has spent much of his career studying how to effectively collaborate with others, and he hopes that knowledge can facilitate additional collaborations and connections between his alma mater and Purdue.

"The two universities have historically had many connections; current faculty such as **Placid Ferreira, Debasish Dutta,** and **Tony Jacobi** are Purdue grads, and there are many Illinois grads at Purdue," he said. "There is a tremendous opportunity to leverage these ties for mutually beneficial collaborations."

After earning his Ph.D. in 1987, Sutherland held a visiting faculty position in Mechanical and Industrial Engineering at Illinois for two years before helping to launch Process Design and Control, Inc. (PDC), a startup firm in Champaign. The company specialized in software development, consulting, and training for statistical process control, design of experiments, and machining simulation.

In 1991, he left Illinois for the upper peninsula of Michigan, where he joined the faculty at Michigan Technological University (MTU). In 2009, he joined Purdue's College of Engineering.

Jean Gibbons

During the last 21 years, **Jean Gibbons** (B.S. Mechanical Engineering '82, M.S. Mechanical Engineering '85) has helped Grumman/Butkus Associates expand the design services side of the Evanston-based engineering consulting firm.

"When I started in 1989, the company had 18 people and they mostly did energy consulting with a small amount of design work," said Gibbons, the firm's senior vice president and chief operating officer.

Gibbons recently managed the HVAC design of a new research facility—the Center for Nanoscale Materials—at Argonne National Laboratory. This facility provides scientists with highly specialized laboratories, including class 100 and class 1,000 clean rooms and numerous labs. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) presented Grumman/Butkus with a 2008 ASHRAE Regional Technology award for this project.

According to Gibbons, she was well-prepared to work in engineering design and consulting because of her experience at Illinois. But she said the department currently faces tough challenges, such as rising undergraduate tuition costs, and that she'd like to help raise more money for scholarships.

"The top students can't always afford the most expensive schools so this could be one way for alumni to really help," she said.

Another challenge, according to Gibbons, is for Illinois MechSE faculty to continue addressing societal needs with their research and teaching.

"I've always thought energy was important but it's becoming even more important with the nuclear crisis and higher energy prices," she said. "It's important for the department to stay involved in energy research—production, conservation, and management—and to keep training students in energy-related areas so they can someday help solve the problems."

Thomas J. Donovan

The first job out of college for new MechSE alumni board member **Thomas J. Donovan** (B.S. Mechanical Engineering '82) was as a mechanical engineer with Sargent & Lundy, an engineering consulting firm located in Chicago. Although he enjoyed engineering work, he enrolled in law school about two years later and earned his J.D. in 1987 from Chicago-Kent College of Law.

"Combining my interests in technology and the law has provided me the foundation for a very rewarding career as a patent lawyer," Donovan said.

Donovan joined Barnes and Thornburg LLP as a partner in 2000 and has been practicing patent law for almost 25 years. He is a member of the 2011 Intellectual Property Law360 editorial advisory board, an influential publication in the intellectual property field, and serves as an adjunct faculty member at Chicago-Kent College of Law teaching an intellectual property course. Donovan plans to share his experience and knowledge with Illinois students.

"I think it's vitally important to share experiences with the next generation of engineers," Donovan said. "I look forward to helping current students understand the significance of protecting intellectual property."

Donovan continues to be recognized yearly as an "Illinois Super Lawyer" from surveys featured in *Chicago Magazine* and conducted by *Law & Politics*. Proud to be an Illinois alumnus, Donovan said he saw how alumni loyalty to the program encourages research, increases hiring, and advances the reputation of the school.

"Helping inspire loyalty and pride among mechanical engineering alumni is a critical step toward building a successful academic program," Donovan said.

MechSE distinguished alumnus transforming energy industry

"When we shipped our first unit to Google, it cost us 35 cents per kilowatt hour. Within 18 months, it was costing us half that to make electricity."

– KR Sridhar

KR Sridhar wants to change the world, and he may have the power to do it—electrical power, that is. Sridhar (M.S. Nuclear Engineering '84, Ph.D. Mechanical Engineering '90), the founder and CEO of Bloom Energy, is the inventor of a solid-oxide fuel cell technology that is producing clean, reliable, and affordable electricity on site for some of the biggest corporations in America. Ultimately, Bloom Energy wants to provide that energy to everyone in the world.

According to Sridhar, the current energy model—large, capital-intensive power plants burning fossil fuels to create high-voltage electricity that travels hundreds of miles along power lines—can't adequately meet the world's voracious energy appetite.

"We need a paradigm shift for energy," he said.

The paradigm that Sridhar advocates is distributed generation, where electricity is produced at or near where it is used. But unlike some renewable solutions like wind turbines and solar panels, which produce energy only when the wind is blowing or the sun is shining, Bloom Energy has created servers with a footprint the size of a parking space that produce 100kW of power, enough to meet the baseload needs of 100 average homes or a small office building 24/7.

The servers, known as Bloom boxes, are filled with thousands of individual, patented fuel cells. Each fuel cell is a thin (150 microns), four-square-inch ceramic substrate coated with proprietary inks. Oxygen enters the cell from one side and fuel from the other side. An electrochemical reaction inside the cell converts the fuel and oxygen into electricity. The fuel source can be natural gas or bio-gas.

"You don't need to say ahead of time what fuel you'll use to run the box," Sridhar said. "This makes sure the [commodity] markets won't hurt our technology."

A single fuel cell square produces about 25 watts of electricity, or enough to power a light bulb, making it a simple building block. Using an inexpensive metal alloy between each square, Bloom can stack the squares into a device the size of a bread loaf to produce one kilowatt of energy. Stacking 25 one-kilowatt devices together produces 25 kilowatts, and so on.

According to Sridhar, Bloom chose this modular approach because it is quick and easy to install the energy servers.

"If you can install a power plant for someone in a few hours, think about how important that is," Sridhar said.

Google was Bloom's first customer, installing four Bloom boxes in 2008; other customers include Coca-Cola, FedEx, Walmart, Adobe, and eBay, all of whom have paid $700,000-$800,000 per server. In a "60 Minutes" report that aired in 2010, eBay's CEO said its five Bloom boxes running on bio-gas from a landfill have powered 15 percent of its San Jose campus and saved the company $200,000 in one year on electricity.

In 2011, Bloom launched a new service, enabling customers to purchase electricity generated from Bloom servers without having to buy those servers. Caltech was one of the first customers to sign on with the Bloom Electrons program, and currently purchases enough electricity to power one-third of its Pasadena campus.

For now, all of Bloom's customers are in California, where state subsidies promote the adoption of clean energy generation and thus make Bloom's technology affordable for its corporate customers. However, Sridhar believes, as with any new technology, the costs will come down.

"Any new technology you do, you must have a Moore's Law," he said, referring to Intel cofounder Gordon Moore's observation about the pace at which technology advanced in the semiconductor field. "When we shipped our first unit to Google, it cost us 35 cents per kilowatt hour. Within 18 months, it was costing us half that to make electricity."

As for changing the world, Sridhar acknowledged that Bloom hasn't yet met its goal of providing clean, reliable, and affordable energy to everyone on earth, but he is optimistic.

"It will take a while and that is still the goal," he said. "We can accomplish that if we are able to provide distributed generation of electricity with local fuels being available from local sources."

He added: "We're a young company. So far, we've produced enough electricity to power 10,000 homes a year. We build one box per day today; 18 months ago we built one box per month. That's 30 times better in a short time."

Schien's business philosophy, leadership, and philanthropy were recognized when Innoventor won the St. Louis Region Top 50 Company award four times, and he received the 2007 Missouri Small Business Person of the Year award from the U.S. Small Business Administration. Among his other achievements are: 2011 National Prime Contractor by the SBA, 2011 Honorary Board of Directors Member for Easter Seals, 2010 Ernst & Young Entrepreneur of the Year regional finalist, and two-time Easter Seals Missouri Volunteer of the Year. He serves on the Easter Seals international board of directors and on the board of Life Skills, an organization that finds meaningful work for adults and teens with developmental disabilities.

Filling a gap: Alumnus' donation rewards top faculty

As a member and president of the MechSE Alumni Board for more than a decade, **Kent Schien** (B.S. Mechanical Engineering '81) was well aware of the financial challenges facing campus.

"In my conversations with the department head, dean, and chancellor, I heard about the ongoing pressure that Illinois has with dwindling state funds and it appears that [trend] will continue," Schien said. "I knew I needed to do something to help our faculty feel appreciated and encourage them to stay at Illinois. I realized industry needed to step up and help our wonderful university."

As chief executive officer of Innoventor, a progressive, entrepreneurial design-build engineering firm, Schien was poised to make a difference. He endowed a professorship, and he and his wife, **Carol**, were on hand March 4, 2011, when Agricultural & Biological Engineering professor **Yuanhui Zhang** was invested as the first Innoventor professor in Engineering. An expert in indoor air quality, Zhang also conducts research that uses a thermochemical process to convert swine waste into a bio-oil.

Schien founded Innoventor in 1996 in the basement of his St. Louis-area home, exploiting a need that arose from the corporate downsizing trend of the late 1980s. Within 10 years he built a multi-disciplinary team of more than 100 engineers who support customers in a variety of industries. According to Schien, companies were cutting the development staff from their R&D efforts so they lacked the engineers to make the next-generation products that their research teams had created.

"There was a niche there that needed to be filled," Schien said. "As Innoventor's name indicates, we invent for ourselves and we innovate for others. There are not a lot of firms like us who go to Lockheed, Boeing, and Caterpillar and solve tough problems for them."

With a client base that includes dozens of Fortune 500 firms, Innoventor's engineers apply their production, process, and product development expertise to many industries, including aerospace/defense, renewable energy/agriculture, medical/pharmaceutical, automation, and transportation.

Before starting Innoventor, Schien worked for McDonnell Douglas for 10 years, where he became ground support manager for the Space Station program. He then worked for LaBarge, Inc. for four years, helping the electronics manufacturing company reduce its dependency on defense contracts to 50 percent while doubling its revenues.

Once he decided to start his own firm, Schien adopted some of the same management principles that helped Silicon Valley companies like Intel and Amgen succeed.

"Those companies had a different approach to how they managed their professional organization," Schien said. "I realized we can manage people differently; we can allow them the right to decide when they work and when they're at home as long as they keep their internal and external customers happy."

Philanthropy is another aspect that Schien incorporated into his company's culture. One of the biggest beneficiaries of Innoventor's generosity is Easter Seals, a non-profit organization that helps people with disabilities live, learn, work, and play in their communities. Innoventor employees have raised nearly $300,000 for Easter Seals over the years, making the company one of Easter Seals' leading single contributors in Missouri.

"When I joined McDonnell Douglas I realized I didn't even know any engineers other than my professors. I was lucky because I liked engineering, so I decided then that if I could ever help anyone decide whether they liked engineering or not I wanted to impact them."

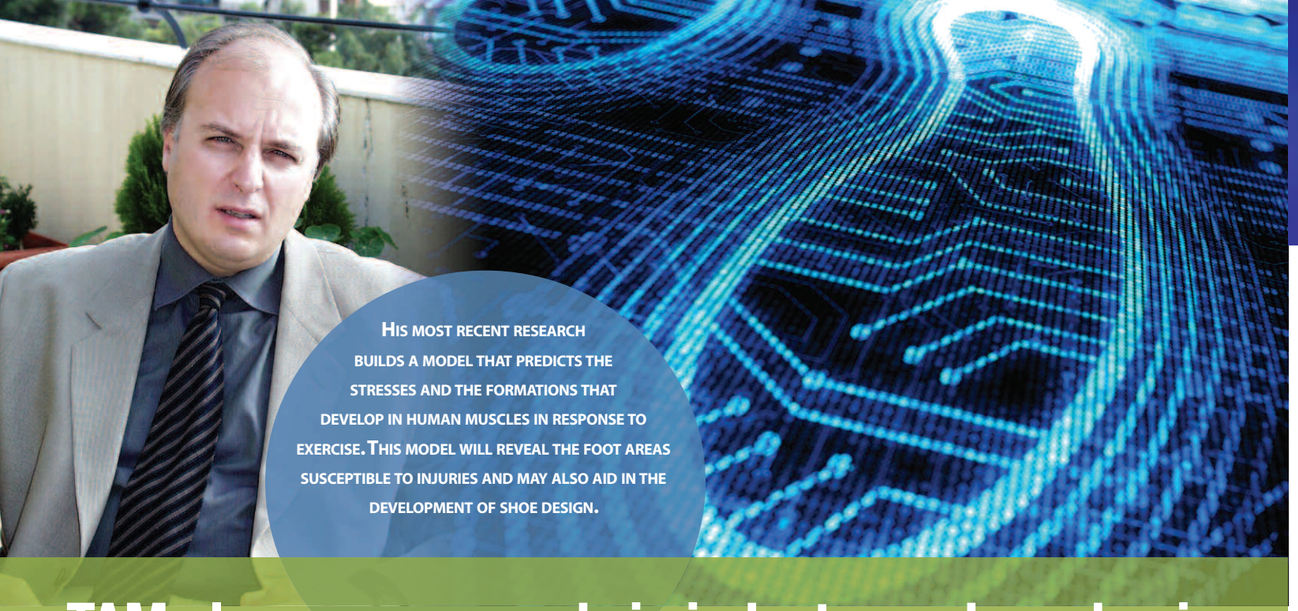
– Kent Schien

Schien's philanthropy extends beyond gifts of time and money. At Innoventor, he has established several opportunities—co-op, extern, and intern programs—for young people to experience engineering and prepare for a successful career.

"When I joined McDonnell Douglas, I realized I didn't even know any engineers other than my professors," Schien said. "I was lucky because I liked engineering, so I decided then that if I could ever help anyone decide whether they liked engineering or not I wanted to impact them."

The University of Illinois has also recognized his accomplishments with the 2009 MechSE Distinguished Alumni Award and the Alumni Association's 2008 Constituent Leadership Award, which he shared with **Rick Furkert** (B.S. Engineering Mechanics '70, M.S. TAM '72) for their efforts in merging the alumni boards of the Department of Theoretical and Applied Mechanics and the Department of Mechanical and Industrial Engineering.

He currently serves on the College of Engineering's Board of Visitors, an advisory group that develops and implements strategic priorities to sustain and enhance academic excellence, connect scholarship to societal impact, and continue to affirm the tradition of excellence that is the hallmark of an Illinois engineer.



His most recent research builds a model that predicts the stresses and the formations that develop in human muscles in response to exercise. This model will reveal the foot areas susceptible to injuries and may also aid in the development of shoe design.

TAM alumnus succeeds in industry and academia

Volcanoes erupting in Iceland prevented MechSE Distinguished Alumnus **Nick Aravas** (TAM, M.S. '82, Ph.D. '84) from receiving his 2010 Distinguished Alumni Award at the University of Illinois campus last year. This year nothing got in his way as he came to campus in April and gave a lecture about his research on the constitutive modeling of skeletal muscle and tendon tissues.

"I try to visit Illinois at least once a year," Aravas said. "I have good friends here, and there are a lot of opportunities for research collaborations."

Originally from Greece, Aravas received his B.S. degree from Aristotle University of Thessaloniki in 1980 before heading to the University of Illinois. He chose to do his graduate work at Illinois because of the influence of Aristotle professor **George Lianis**, who was previously a longtime faculty member at Purdue.

"It was a mixture of ignorance and trust of the professor that I did not apply to anywhere else," Aravas said. "I applied here initially and received a teaching assistantship, which then changed to a research assistantship."

Aravas was honored with the J.O. Smith Award for Teaching Excellence in 1982 when he had a teaching assistantship at Illinois.

After earning his Ph.D., he worked as a senior engineer at the company Hibbitt, Karlsson, and Sorensen, Inc. in Rhode Island and helped develop ABAQUS, a finite element program. In developing the program, he worked on the implementation of constitutive models with materials such as metals.

"He developed numerical integration algorithms for material systems that are used extensively by the mechanics community and have been implemented in commercial finite element codes such as ABAQUS," said professor **Petros Sofronis**, formerly of TAM and currently MechSE's associate head for mechanics programs. "They are also used for the solution of important engineering problems."

In 1986, Aravas joined the mechanical engineering and applied mechanics faculty at the University of Pennsylvania, where he worked for the next 11 years. During his time there he received the Presidential Young Investigator Award.

In 1996, he returned to Greece and became a professor of computational mechanics of structures at the University of Thessaly (UTH). He moved to the position of vice rector for research and development and chairman of the research committee and then was elected dean of engineering from 2004 to 2007. He later served as chairman of the department of Mechanical Engineering and acting chairman of the departments of Civil Engineering and Computer and Communication Engineering at UTH.

Recently, he played a key role in establishing the Center for Research and Technology and became the director of Mechatronics Institute, which is connected to three other institutions: Institute of Technology and Management of Agriculture, Institute of Biomedical Research and Technology, and Institute of Human Performance and Rehabilitation. These facilities were created to advance innovation in the industrial section of Thessaly.

Aravas' work continues to have an impact on composite materials, structures, metal forming, computer manufacturing, and much more. His most recent research builds a model that predicts the stresses and the formations that develop in human muscles in response to exercise. This model will reveal the foot areas susceptible to injuries and may also aid in the development of shoe design.

"The next application would be to see the effect that the shape and size of the shoe has with transmitting the load of our bodies to our foot," Aravas said.

Aravas credits his success to the education he received at Illinois, particularly the great experience he had working with professor **Robert McMeeking**, who supervised his doctoral work.

"If I hadn't been a graduate student in TAM, I wouldn't have had the career I had," Aravas said. "The department was really good and the faculty was first rate."

Lu making mark
at the forefront of tech industries

Lu recalls getting valuable advice from a College of Engineering Placement adviser when he was a student. "He told me to slow down, and I did, which allowed me to take some valuable elective courses," Lu said. "Those courses helped me become a good manager and executive later when I had to communicate with bankers and lawyers."

Sidney Lu (B.S. Mechanical Engineering '81) knows how to work hard. During his first year at the University of Illinois, he earned 58 credit hours—almost twice as many as a typical freshman. During his first three years at Foxconn Technology Group, a world leader in contract manufacturing services, he worked 80-hour weeks, averaging 310 work days annually.

His hard work has paid off: 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. On April 15, his alma mater recognized his achievements by presenting him with a 2011 Mechanical Science and Engineering Distinguished Alumni Award.

As head of the NWInG, Lu is responsible for 100,000 employees working on interconnect products such as connectors, cables, wire harnesses, switch gear, antennae, and keypads for the computing, communication, consumer electronics, and automotive industries.

"If any of you have a laptop, tablet, or smart phone, Sidney Lu probably had something to do with it," said MechSE Head **Placid Ferreira** before presenting the alumni award to Lu.

According to Ferreira, Lu has played a key role in introducing scientific analysis and total quality control throughout engineering, product development, and manufacturing operation processes. Under his leadership, NWInG dominates the computing-related connector and cable field.

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

Lu's 20-year career with Foxconn began as a design manager on connectors. Within 18 months, he was in charge of a development group of 60 engineers. A few years later, he took over a business unit that included manufacturing. By 2003, he was promoted to be in charge of the whole connector and cable operations. Although Lu acknowledged that hard work and talent have played a role in his success, luck was part of it, too.

"I was lucky that I found the right company to join at a time when they were small," he said. "I joined Foxconn when it had $67 million in revenue; the company has over $100 billion now in revenue."

As a student, Lu recalled getting valuable advice from a College of Engineering placement adviser.

"He told me to slow down, and I did, which allowed me to take some valuable elective courses," Lu said. "Those courses helped me become a good manager and executive later when I had to communicate with bankers and lawyers."

One of those courses was Accounting 101, which gave Lu a fundamental understanding of financials such as balance sheets and income statements. In addition to his ME degree, Lu also earned a bachelor's degree in mathematics.

Lu's first job out of school was with the Packard Electric Division of General Motors in Ohio, where he performed load flow and dynamic analyses of connectors. After seven years and three promotions, Lu left Packard/GM and took a manufacturing job with AMP (now known as TE Connectivity)—a leading maker of terminals, connectors, and related products found in electronics from toasters to supercomputers. He joined Foxconn in 1990.

In 2011, he returned to the University of Illinois to receive a Distinguished Alumni award from MechSE.

"I'm grateful to Illinois," Lu said. "I learned hard work here, and I learned how to learn."

Plummer receives University Alumni Achievement Award

Roger L. Plummer (B.S. Engineering Mechanics '64) was honored with the 2010 University of Illinois Alumni Achievement Award. Established in 1957, this award is the highest honor the University may bestow on a graduate, and is presented to those alumni who have attained outstanding success and national or international distinction in their chosen profession or field. Plummer joined 157 other notable recipients of this honorable award, including Nobel Prize winners, U.S. naval admirals, and past university presidents.

Plummer is recognized for his groundbreaking contributions to the field of telecommunications. Beginning his 30-year career in the Bell System as a management trainee, he advanced through positions in engineering, network operations, sales, and marketing to become operations vice president for Illinois Bell. In 1987, he was chosen as president and CEO of Ameritech Information Systems, where he integrated direct sales and service operations of Ameritech's five Bell Operating Telephone Companies and developed strategic initiatives in systems integration, health care information networks, document imaging, and library automation.

Since retiring in 1994, Plummer has devoted himself to supporting not-for-profit organizations, including the University of Illinois, where he chaired the UI Alumni Association Board of Directors, served on the Board of Trustees, and is a current board member for the UI Foundation. He also provides senior leadership for the International Engineering Consortium, which fosters partnerships between academia and the high-tech industry segments, such as telecommunications and electrical power, to address major opportunities and challenges of the information age.

As a past recipient of the University of Illinois Distinguished Service Award, the College of Engineering Alumni Award for Distinguished Service, and the Department of Mechanical Science and Engineering Distinguished Alumnus Award, Plummer's dedication and reverence for the University and the MechSE Department are well-recognized and greatly appreciated.

USA Today recognized Plummer in 1988 as one of the Top 10 Black Executives in America. A dynamic leader, Plummer is described as positive, upbeat, articulate, and very focused. His volunteerism and philanthropy stretch across vast areas, including educational, health care, and cultural institutions in the Chicago area, in addition to his work and generosity with the University of Illinois.

Nowicki, Parkinson named Distinguished Alumni

John J. Nowicki (B.S. Mechanical Engineering '56) and Alan R. Parkinson (M.S. Mechanical Engineering '79 and Ph.D. Mechanical Engineering '82) were both honored with 2010 Distinguished Alumni Awards by the Department of Mechanical Science and Engineering.

John J. Nowicki was born in Chicago, Illinois. He graduated from Lane Technical High School in 1948, and then he received a degree in Mechanical Engineering from the University of Illinois in 1956. He served on active duty in the U.S. Marine Corps from January 1951 to May 1952. In 1953 he married Gladys, his wife of 57 years; they have two children, Bob and Linda, and five grandchildren.

He was employed by Advance Heating and Air Conditioning Corp. (now Advance Mechanical Systems Inc.) in Chicago as an engineering draftsman in September 1956. He is currently Chairman of the Board. His career was spent in the design and construction of many prominent Chicago-area buildings. He is a Registered Professional Engineer in the State of Illinois and a life member of ASHRAE.

Alan R. Parkinson is a professor of mechanical engineering and currently serves as dean of the Ira A. Fulton College of Engineering and Technology at Brigham Young University. The college is home to 3,300 students in 11 programs. Previous to his appointment as dean, he was an associate dean from 2003 to 2005 and chair of Mechanical Engineering from 1995 to 2001. He received his Ph.D. and M.S. degrees from the University of Illinois at Urbana-Champaign, and B.S. and M.B.A. degrees from Brigham Young University. Parkinson's areas of research interest include design automation, optimization methods, robust design, and engineering education. He is currently conducting research on cross-cultural virtual engineering design teams. He is a co-author of a commercial optimization software package, called OptdesX, which has been used at companies and universities in the United States and Europe.

In 2003, he received the Design Automation Award from the American Society of Mechanical Engineers for his work in robust design and design optimization. Dr. Parkinson was elected to Fellow status in the American Society of Mechanical Engineers in 2004.

Underwriters Laboratories CEO
wins Chicago Alumni Award

You may not know **Tom Castino** (B.S. Mechanical Engineering '60), but his work touches your life every day. He has spent his career making everyday products safer for more than four decades at Underwriters Laboratories, Inc. (UL), where he eventually became president and CEO. In 2011, the University of Illinois Alumni Association and the Chicago Illini Club recognized Castino's service by presenting him with the 2011 Chicago Illini of the Year Award.

UL is an independent product safety certification organization that tests products, conducts factory inspections where the products are made, and writes standards for safety. More than 25 billion products manufactured worldwide now carry the UL mark.

"Everything I am in my career is because of the University of Illinois," he said. "It changed everything for what my life was supposed to be."

The son of an Italian-American merchant who sold laundry products in the Chicago area, Castino was destined to someday take over his father's business with his brother. His father suffered a stroke at the age of 50 and nearly died.

"Even though he wasn't speaking very well because of the stroke, my dad tearfully told me to go to college and be somebody," Castino said.

Living at home to help with the business, Castino first attended the University of Illinois at Navy Pier and then transferred to Urbana-Champaign. After earning his bachelor's degree in 1960, he accepted a job offer with UL as an assistant engineer in the company's Chicago Fire Protection Department.

Early in his career at UL, Castino spent two years at the National Bureau of Standards (now known as the National Institute for Standards and Technology) in Washington, DC, where he became an expert on the flammability of building materials and developed several fire tests for those materials, enhancing the safety of buildings.

As UL's chief engineer in the early 1980s, Castino helped develop and promote methods for electronic safety signaling. The standards that UL devised improved the effectiveness of products such as smoke detectors. Castino also managed the group that developed standards for the first carbon monoxide detectors.

Named UL's president and chief executive officer in 1990, Castino embarked on what would become his biggest achievement at UL: globalizing the non-profit organization. During his 12-year tenure, Castino managed UL's international growth from a single branch office in Hong Kong to 23 subsidiaries in Asia, Europe, and North and South America. This growth nearly doubled UL's staff worldwide and more than doubled the number of UL marks placed on products.

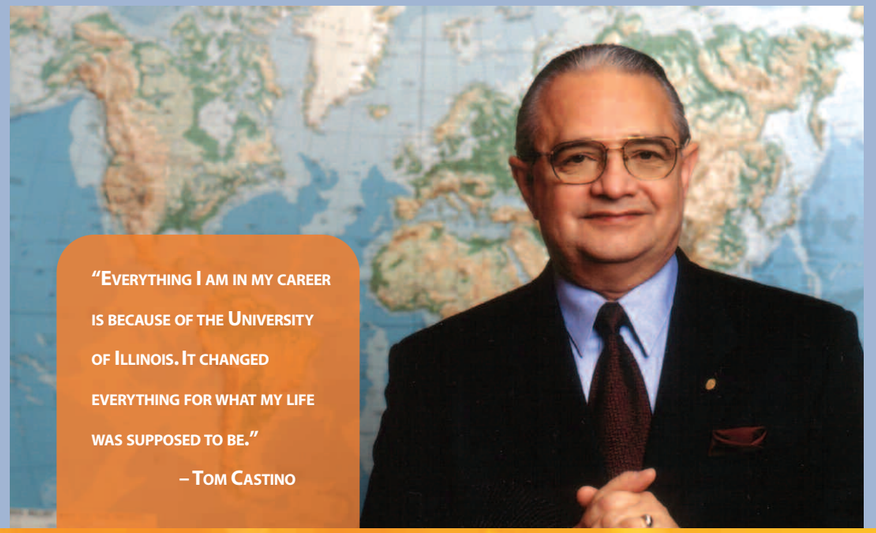
"UL could better serve the United States and the world," Castino said about the expansion. "I'm proud of the fact that we nationalized all the subsidiaries so, for the most part, the people running those facilities are from those countries."

Castino also played a major role in the opening of a new U.S. facility in Camas, WA. This UL facility, which employs more than 200 people, specializes in the testing and certification of wire and cable and an array of equipment for the audio/visual, medical, and dental fields. To honor Castino when he retired in 2003, UL named the Camas facility after him.

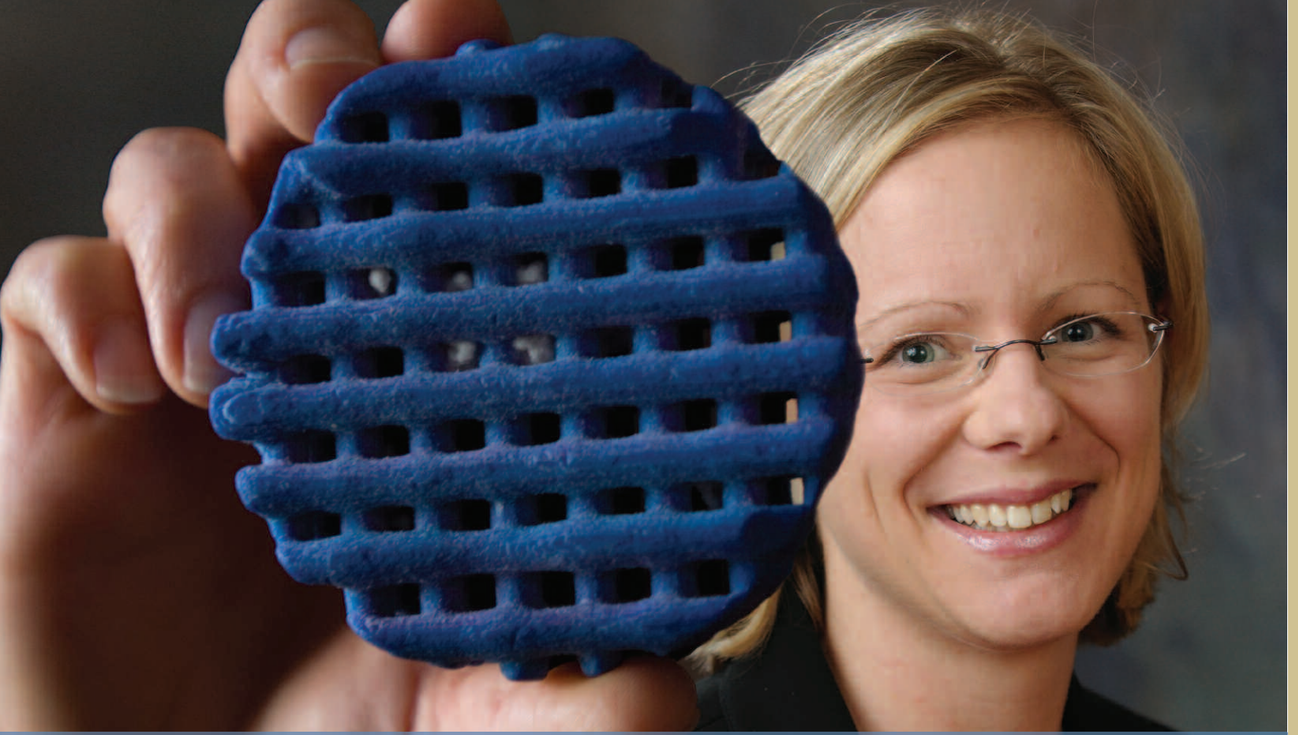
Castino's devotion to Illinois is evident in his service to the MechSE department. He and his wife, **Joan**, have supported an undergraduate scholarship in the MechSE department for nearly 20 years. A member of the MechSE Alumni Board, Castino helped negotiate and facilitate aspects of the merger between the departments of Mechanical and Industrial Engineering and Theoretical and Applied Mechanics. Castino said that he's compelled to give back because the university enabled him to succeed professionally.

"Illinois rounds the whole person," Castino said. "I learned to lead and communicate there."

Among Castino's other awards are the prestigious American National Standards Medal, the Hollis Award from the National Industry Defense Association, the Drake Award from Worcester Polytechnic Institute, the Wherry Award from the Steel Door Institute, the Standards Engineering Society's Leo Moore Medal, the 1997 University of Illinois Department of Mechanical and Industrial Engineering Distinguished Alumni Award, and the 2003 Illinois College of Engineering's Alumni Award for Distinguished Service.



"Everything I am in my career is because of the University of Illinois. It changed everything for what my life was supposed to be."
– Tom Castino



Utilizing mechanical engineering for biological benefits

Thanks to MechSE assistant professor **Amy Wagoner Johnson,** a major void may be filled in bone replacement technology.

Even when bone replacements require filling a gap that is less than a centimeter in size, they have required an allograft (bone from another part of the patient such as the hip) or an autograft (bone from a donor). But allografts increase the wear and tear on patients, and according to the Mandible Reconstruction Project, the complication rate for autografts exceeds 30%.

Coming at the problem from a mechanical engineering angle, Wagoner Johnson and her colleagues are using manufactured "scaffolds" to bridge the gap where only actual bone has been used before.

"Having the bone in the micropores will toughen the material, and it will also make a fully interconnected matrix of bone," Wagoner Johnson said. "Some of my work has shown that this particular type of bone-tissue scaffold was really a lot more effective in-vivo. So now we're trying to go back into a dish to figure out what it is about the material or the environment that gave us this really unexpected result."

Working with her research group colleagues at Illinois—including MechSE professor and College of Engineering associate dean for research **Andrew Alleyne**—and other schools, Wagoner Johnson creates these bone tissue scaffolds out of calcium phosphate-based materials, like hydroxyapatite (HA). Doctors already use HA routinely for hip and dental implant coatings and to fill smaller bone defects. Scaffolds that can heal large and load-bearing defects are still being investigated and this scaffold system may be one solution.

Wagoner Johnson's team has found that micropores 5-40 microns in diameter within the rods of the scaffolds, which also have pores between the rods, stimulate more bone growth than scaffolds with only pores between the rods. These micropores not only stimulate bone regeneration within the larger pores, but they also make bone growth more uniform within the scaffold and stimulate bone growth within the micropores themselves. These researchers proved, even though it was previously thought not possible, that bone is possible to grow in pores this small.

"We want to understand what it is about that environment that makes the cells work to get into those small pores," Wagoner Johnson said. "They have to want to go in there, and so we want to know why."

The ability to analyze the growth process of bone within these structures is important because it will help them understand what variables influence bone regeneration and how to build scaffolds with custom details to fit the specific characteristics for each individual.

"When we have solid rods we form kind of a ring of bone on the outside, at the scaffold/defect boundary, and it doesn't grow all the way to the center; whereas, for the ones that have porosity in the rods, bone does grow all the way through," Wagoner Johnson said. "You want to have bone all the way through your implant so that the middle of it can also be viable."

The research group is currently working on ways to fabricate these scaffolds with multiple materials to further customize the scaffolds and make more complex shapes.

The process of tailoring the number of micropores and varying materials of the scaffolds produces opportunities to make versatile and ideal bone replacements.

"You have bone in your body that is really dense and some that is porous," Wagoner Johnson said, "so when we build our scaffolds we might make regions that are more like the dense bone or more like porous bone."

Micro-technology implementation

means huge improvements in manufacturing

"Industry is eager to harness the potential of micro-technology, but has been unable to do so for most consumer products because of the high manufacturing cost," explained MechSE's **William P. King**, a Willett Faculty Scholar who was also named a College of Engineering Bliss professor in 2011. "Our low-cost, scalable micro-manufacturing technology changes the game."

"Microstructures molded onto a surface can change the properties of that surface," King added. "By molding microstructures into a surface, we can engineer the surface friction, heat transfer coefficient, or water repellency. All of these are in demand for energy applications, from hydraulic equipment to air conditioners to batteries."

King's innovation was recently selected by the Society of Manufacturing Engineers as one of the "2011 Innovations That Could Change the Way You Manufacture." This award is given to new and emerging technologies that are making a difference in manufacturing.

"This award recognizes our technology for micro-machining applied to consumer products," King said. "This technology is creating good manufacturing jobs today and tomorrow." The technology is being commercialized by Hoowaki LLC, a company co-founded by King in 2008. Hoowaki customers include many Fortune 100 companies.

According to King, micro-machining is used to fabricate complex microstructures onto the surface of metal molding tools, the metal templates used to form plastic, glass, or metal parts in a manufacturing process. The microstructures on the molding tools are transferred onto the final part during injection molding, embossing, or rolling. The presence of the microstructures on the final part changes the properties of the part.

"We can design the surface microstructures for the desired performance. We can increase or decrease friction, control water repellency, or store energy."

"This is very high value-added technology," King remarked. "It dramatically changes the product that you are already buying today, resulting in improved performance and new properties. For example, one of the users of this technology is a company that is making implanted medical devices that run off of a battery. Because the battery is implanted in your body, it must be small and carry as much energy as possible. By putting microstructures inside the battery, we can increase the battery surface area, which means more energy."

According to King, incorporating microstructures into a design can also reduce the amount of energy needed to run some machines.

"Increasing surface area changes the way that liquids interact with the surface, for example in the kinds of heat exchangers in your car or in an airplane. Similarly, you can heat or cool a home or building with much less energy."

More than improving a specific technology, King considers the technology as a "game changer," providing a significant opportunity for American industry.

"This is the way that manufacturing comes back to the U.S.," King added. "It's high-tech that we can lead. It adds a lot of 'know how' but at little cost, and it results in dramatically different performance for the things that you are buying today."

2011 sees three faculty additions, two major departures

New Faculty

Elif Ertekin

New assistant professor **Elif Ertekin** comes from a postdoctoral research scientist position at the Massachusetts Institute of Technology. Ertekin works in the field of computational materials research: a research area that uses computer simulations, modeling, and theories to describe the properties of materials, including nanoscale systems such as carbon nanotubes, and bulk systems such as new materials for solar cells.

"I think the richness of the behavior that you can get out of materials—combining materials in different ways and introducing interfaces between materials—is pretty amazing," Ertekin said.

Ertekin received her masters and doctorate from the University of California-Berkeley. In fall 2011, she introduced a new special topics course on the fundamentals of photovoltaics. This course covers the intricacies of how a solar cell works. The content elaborates on all processes that are necessary for the successful conversion of sunlight to electricity, such as absorbing light, separating charge, transporting charge, and collecting charge.

Randy Ewoldt

New assistant professor **Randy Ewoldt** specializes in non-Newtonian fluid mechanics and Rheology. Non-Newtonian fluids often combine both fluid and solid behavior, existing as substances somehow between those two areas–like hair gel and snail slime. Such squishy materials are ubiquitous in nature, and Ewoldt likes to take ideas from nature to discover fundamental principles that can be used with engineered systems.

"I try to understand non-Newtonian fluids from a fundamental level and also use them for applications," Ewoldt said.

He develops mathematical models and experimentally studies the physics of complex fluids and soft materials. As a graduate student at MIT, Ewoldt used his analysis of the fluid to replicate snail-like wall climbing with a mechanically-engineered device. In his first semester at Illinois, he has focused on building his laboratory. During the spring semester, he will help teach fluid mechanics. He soon hopes to start a special topics course in non-Newtonian fluids and rheology.

Seok Kim

Inspired by gecko foot hairs, butterfly wings, snake skins, and fish scales, new assistant professor **Seok Kim** looks at biological systems for ideas on how to create and arrange materials with the most effective system architecture. As a postdoctoral research associate with Rogers Research Group at Illinois, Kim worked with transfer printing and how to adhere microstructures to elastomeric surfaces.

"In human society everywhere there is some order," Kim said. "In the academia field I think there is more creativity and freedom."

Kim received his masters at the University of California at Los Angeles and doctorate at Carnegie Mellon University. For Rogers Research Group, Kim developed aphid foot-inspired microtip surfaces that improved transfer printing and increased the difference of adhesion by a factor of 1,000. Transfer printing enables diverse materials in various micro- and nano-structural forms to move from one substrate to another by using soft, elastomeric stamps.

"These ideas represent a new way to do manufacturing of electronic semiconductor devices," said renowned professor John Rogers, Kim's former adviser.

Retirement

The incredible 42-year career of **Jim Phillips**, MechSE professor and associate head for undergraduate programs, came to an official close on May 15, 2011 with a lively retirement celebration. He remains with MechSE as an emeritus professor.

"I think I'll miss the students the most," Phillips said. "I enjoy working with the students. We have a wonderful group of undergraduates in the Engineering Mechanics program, and the program is growing. It's an exciting time and we have a strong and robust student body in that curriculum with good-sized classes, especially at the upper-division level, and a lot of excitement."

After receiving his Ph.D. from Brown University, Phillips came to Illinois in 1969 as an assistant professor in the Theoretical and Applied Mechanics (TAM) department. He remained a pillar of the TAM department for more than just years; it was literally decades. He became associate head of TAM in 1985 and continued in that role until the department merged with Mechanical and Industrial Engineering to form the new MechSE department in 2006.

Farewell

Bob Coverdill, who directed MechSE's engineering and technical services for years, left the department in August 2011 to become director of the National Science Olympiad. It's difficult to sum up what Coverdill meant to the MechSE department over his 24-year stay; he did so many things it was nearly impossible to track them all.

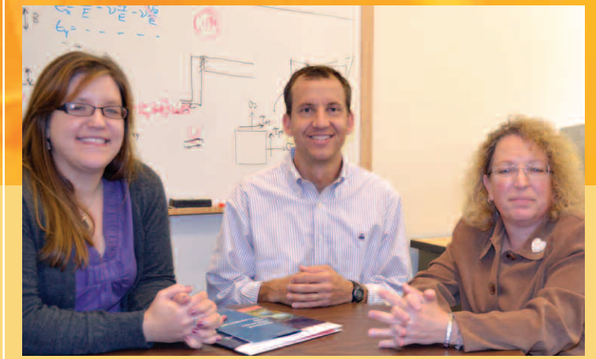
"I've been involved in almost every aspect of the department life: teaching, research, machine shop, facilities, computer support, alumni affairs, and on and on," Coverdill said. "I've been very thankful for all these opportunities."

Coverdill started his time here as an undergraduate in Mechanical Engineering in the early 1980s. He has had countless accomplishments over the years, and he points to the Mechanical Engineering Laboratory building's massive renovation and expansion as the biggest of them all. He has received recognition for the unparalleled value he brought to the job, including the Chancellor's Academic Professional Excellence Award.

"I will cherish every year that I've spent here in this department," Coverdill said. "They haven't always been easy, but the rewards have been great. I look forward to the next 25 years for this department, and I look forward to great things."

New leaders named for undergrad and grad offices

MechSE's undergrad office: Jenny Ehrnthaller, Associate Head Andreas Polycarpou, and Emad Jassim.



MechSE's grad office: Katrina Hagler, Associate Head Harley Johnson, and Kathy Smith.

MechSE Undergraduate Programs Office

Professor **Andreas Polycarpou** became MechSE's new Associate Head for Undergraduate Programs in May 2011. He took the position aiming to improve an already excellent undergraduate curriculum.

"I have been part of the undergraduate programs committee, and last year we devised what we call a design stem," Polycarpou said. "So now we're offering the students, from the first year all the way to their senior year, opportunities to be involved in some sort of design."

Since joining the University of Illinois in 1999, Polycarpou has established a preeminent research program, has published 126 archival journal articles, and has received 11 U.S. Patents, with contributions from engineering applications to advances in our fundamental understanding of friction and wear. He is an internationally renowned scholar, and he has been recognized for his scholarship through numerous awards.

In moving to a leadership position overseeing a large program, he noted that the existing staff made the transition much easier. **Emad Jassim**, the director of undergraduate programs, and **Jenny Ehrnthaller**, the undergraduate programs coordinator, provided a solid core for the office, with support from assistants **Marian Brinkerhoff**, **Amanda Houser**, and **Tammy Smith**.

"The excellent staff that we have in place already has a great handle on our advising, tours, and things like that," Polycarpou said.

Over the years, Polycarpou has shown great dedication to university involvement, and he currently serves on three critical committees: the Campus Promotion and Tenure Committee, the Faculty Advisory Committee, and the Vice Chancellor of Research (VCR) Compliance Advisory Committee. He also serves as a campus Faculty Senator.

"I always like to be challenged, I like something different, something new," Polycarpou said. "I understand we do research and we are really, really good at it, but I look at it that our main mission is really undergraduate education."

MechSE Graduate Programs Office

Professor **Harley Johnson** officially took the reins as MechSE's new Associate Head for Graduate Programs in August 2011. He stepped into the role focused on setting and going after some lofty goals.

"We're always trying to become a more competitive department and there are a lot of aspects of graduate education that play into that: placement of students, competing for the best incoming students, competing to build a more diverse graduate student body," Johnson said. "We want to have the highest standards we can, and I think that focusing the graduate program and improving the student experience, the quality and diversity of the students, job opportunities, placements, and so on are ways we can move not only the graduate program forward but the whole department forward."

Johnson received his Ph.D. from Brown University in 1999 and came to Illinois in 2001. In his research, he studies micro- and nanomechanics of electronic materials, mechanics of nanostructures, materials behavior in microelectromechanical systems (MEMS), and the mechanics of photonic materials. He leads the Nano-Electro-Opto Mechanics Group, which uses atomistic and continuum modeling methods to understand coupled mechanical and electronic or optical behavior.

"Harley has achieved high levels of success ever since he came to Illinois," said MechSE department head **Placid Ferreira**. "He has reached high levels of achievement in all of the important facets that go into being a successful faculty member and researcher for a top university."

Johnson noted that having an accomplished staff—graduate programs coordinator **Kathy Smith** and graduate admissions coordinator **Katrina Hagler**—already in place is a big help and will help him take on initiatives right away.

"I'm very excited to join the office of graduate programs," Johnson said. "I think that focusing on graduate education is one way to really help the department move forward, and it's something I really care a lot about."

Andrew Alleyne was awarded a National Reseach Council (NRC) Research Associates Program fellowship in 2011 to address thermal management systems challenges on-board future air vehicle platforms.

Narayana Aluru was invested as a Kritzer Distinguished Professor in 2009. He was named an ASME Fellow in 2011. He was named a University Scholar in 2010.

Armand J. Beaudoin received a 2009 BP Award for Innovation in Undergraduate Instruction and was named an Engineering Council Outstanding Adviser.

Kenneth Christensen was named an AIAA Associate Fellow in 2010. He received the APS-DFD Francois Frenkiel Award in recognition of significant contributions to fluid mechanics in 2011. He received the university's Arnold O. Beckman Research Award in 2011. He was also appointed to the editorial board of *Measurement Science of Technology* in 2011.

Harry Dankowicz was promoted to full professor in 2011. He was named an associate of the UIUC Center for Advanced Study for 2011-12. Following his leadership role in organizing a transnational partnership between UIUC and three universities in Stockholm, Sweden, he was appointed faculty liaison for the Illinois-Sweden Program for Educational and Research Exchange (INSPIRE). In 2011, the ASME approved him as editor for *Applied Mechanics Reviews* with term beginning in January 2012.

Geir E. Dullerud was named an ASME Fellow in 2011.

Debasish Dutta was named a Gutgsell Endowed Professor in 2009. He was named director of the National Academy of Engineering study Lifelong Learning Imperative in 2011.

Placid Ferreira was named an SME Fellow in 2011.

Jon Freund was named a Kritzer Faculty Scholar in 2011. He received a promotion to full professor in 2010. He received a Xerox Award for Faculty Research from the College of Engineering in 2010.

Nick Glumac received the MechSE Alumni Five-Year Effective Teaching Award in 2010. He also received the AIAA Best Paper Award in 2009.

Naira Hovakimyan was appointed a Schaller Faculty Scholar in 2011. The University of Illinois named her a University Scholar in 2011. She received AIAA's Mechanics and Control of Flight Award in 2011.

Predrag Hrnjak received the Gustav Lorentzen Medal from the International Institute of Refrigeration.

K. Jimmy Hsia was appointed the University of Illinois' Associate Vice Chancellor for Research for New Initiatives. (See page 4 for more about Professor Hsia.)

Anthony Jacobi was named an ASME Fellow in 2011. He was elected a Fellow in the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) in 2009.

Harley Johnson received a promotion to full professor in 2011. He was named the new associate head for graduate programs in MechSE in 2011 (see page 23). He was named a Kritzer Faculty Scholar in 2010. He received ASME's Thomas J.R. Hughes Young Investigator Award and Xerox Award for Faculty Research from the College of Engineering in 2010.

Shiv Kapoor received the MechSE Alumni Five-Year Effective Teaching Award in 2011. He also received a Wu Research Implementation Award from NAMRI for outstanding original research in 2010.

William King received a promotion to full professor in 2010. He was named a Bliss Professor by the College of Engineering in 2011. His work was featured in SME's "Innovations that will Change Manufacturing" in 2011. In 2010, he was named a Willett Faculty Scholar. He won the Best Paper Award at the IEEE Sensors Conference in 2010. He received the Edison Award for Innovation from the Naval Research Laboratory in 2010. He was also named an ASME Fellow in 2011. (See page 21 for more about Professor King.)

Dimitrios Kyritsis received the Alumni Two-Year Effective Teaching Award for both 2010 and 2011. He received the Campus Award for Excellence in Undergraduate Teaching for Faculty in 2011. He received the 2011 Teaching Excellence Award from the College of Engineering. He was also named an AIAA Associate Fellow in 2010.

Chia-Fon Lee was named an SAE International Fellow in 2010.

Moshe Matalon received AIAA's Pendray Aerospace Literature Award in 2010. He received the Campus Center for Advanced Study Award in 2010. He also received the Distinguished Paper recognition in the Laminar Flames colloquium of the 33rd International Symposium on Combustion in 2010.

Prashant Mehta received a promotion to associate professor in 2011.

Norm Miller received MechSE's Alumni Five-Year Teaching Award in 2011.

Robert Miller received the Alumni Award for Distinguished Service from the College of Engineering in 2010.

Martin Ostoja-Starzewski published the book *Thermoelasticity with Finite Wave Speeds* in 2009. In 2010, Essential Science IndicatorsSM named his paper one of the most-cited in New Research Areas of Engineering.

Andreas Polycarpou was named the new associate head for undergraduate programs in MechSE in 2011 (see page 23). He was named a Wilkins Professor in 2011. He also was named a 2011-12 Fellow for the Committee on Institutional Cooperation's Academic Leadership Program.

Taher Saif was named an Edward William and Jane Marr Gutgsell Endowed Professor in 2009. He was named an ASME Fellow in 2011. (See page 4 for more about Professor Saif.)

David Saintillan received the 2011 Pi Tau Sigma Gold Medal in Mechanical Engineering. He also received the Arnold O. Beckman Research Award from the UIUC Research Board in 2010.

Huseyin Sehitoglu received ASTM International's Fatigue Lecture Award in 2009 for his extensive contributions to the field of fatigue of materials.

Mark Shannon was named an ASME Fellow in 2011. He also received the Innovation Discovery Award at the sixth annual Innovation Celebration at the University of Illinois Research Park.

Sanjiv Sinha received NSF's CAREER Award in 2010. He also received the DARPA Young Faculty Award in 2011.

Petros Sofronis received the U.S. Department of Energy's 2011 Delivery Team Award. He also was named the director of the new International Institute for Carbon-Neutral Energy Research, or I^{2}CNER (see page 5).

Brian Thomas received the TMS Application to Practice Award in 2011. He was elected to ASM International's College of Fellows in 2009.

Daniel Tortorelli received the College of Engineering Collins Award for Innovative Teaching in 2010. He also co-edited *Special Issue: Papers Dedicated to the Memory of Donald E. Carlson, Journal of Elasticity*, in memory of the late TAM professor.

Kimani Toussaint, Jr. participated in the 8th Annual Keck Futures Initiative in 2010. He also received the NSF CAREER Award and was named an IEEE Senior Member in 2010. He was elevated to the rank of Senior Member in the Optical Society of America (OSA) in 2011.

Alexander Vakakis was invested as a Wilkins Professor in 2009.

Amy Wagoner Johnson received NSF's Young Investigator Award in 2011. She received the 2011 Arnold O. Beckman Award. She also co-authored the book *Mechanobiology of Cell-Cell and Cell-Matrix Interactions*, published in 2011. (See page 12 for more about Professor Wagoner Johnson.)

Faculty In Memoriam

We have recently lost many of the faculty who helped make the storied history of engineering at Illinois. They will be missed, and we hope to carry on in the great tradition they have bestowed upon us.

Hassan Aref died September 9, 2011, at his home in Deland, Illinois. He was 60 years old. Aref graduated from the University of Copenhagen in 1975 and from Cornell University with a Ph.D. in physics in 1980. He was the head of the Department of Theoretical and Applied Mechanics (TAM) at Illinois from 1992 to 2003. At the time of his death, he had just returned full-time to the Engineering Science and Mechanics faculty at VPI after a Niels Bohr Visiting Professorship at the Technical University of Denmark (2006–2010). Aref was particularly well known for developing the concept of chaotic advection in fluid mechanics. He was awarded the Otto Laporte Award from the American Physical Society, a doctorate technices honoris causa from the Technical University of Denmark, and the G. I. Taylor Medal of the Society of Engineering Science. He was also a Fellow of the American Physical Society, the American Academy of Mechanics, and the World Innovation Foundation. He held many leadership positions in the International Union of Theoretical and Applied Mechanics. He also led the efforts to establish System X, the first academic computer to exceed 10 teraflops.

Donald E. Carlson died August 21, 2010. He was 72 years old. As a student at Illinois, he graduated with Bronze Tablet honors in the first engineering mechanics class (1960). After receiving a master's degree in TAM, he attended Brown University for his Ph.D. In 1964, he returned to Illinois to begin a 42-year career of teaching and research in TAM, serving on three occasions as interim or acting department head (1970–1971, 1988–1989, and 1991–1992). Carlson advised hundreds of undergraduate students, and served on innumerable qualifying, preliminary, and final examinations at the graduate level. He advised or co-advised 15 doctoral students in mechanics. His many papers on applied mechanics are widely acclaimed. He received the AAM Lifetime Service Award in 2005. Carlson was editor of the Journal of Elasticity from 1982 to 1997. He retired from Illinois in 2006 but continued to write, and in 2010 completed an invited paper to appear in a special Mathematics and Mechanics of Solids volume. A departmental scholarship has been initiated to recognize Carlson's many contributions to the engineering community.

Bei Tse Chao died March 2, 2011. He was 92 years old. After spending his early life in China and then attending graduate school at the University of Manchester, England, Chao came to the Department of Mechanical and Industrial Engineering at Illinois in 1947, becoming a full professor in 1955. Chao became the department head in 1975, and he remained in that position until he retired in 1987. Chao was elected as a member of the U.S. National Academy of Engineering in 1981 due to his pioneering contributions to heat transfer research and leadership in engineering education. Among his many honors and awards were the ASME Blackall Machine Tool and Gauge Award; the Heat Transfer Memorial Award ; the first recipient of the ASEE Ralph Coats Roe Award; Max Jakob Memorial Award given jointly by ASME and American Institute of Chemical Engineers; the Benjamin Garver Lamme Medal (the highest honor from ASEE); the first recipient of the Tau Beta Pi Daniel C. Drucker Eminent Faculty Award; Senior University Scholar, University of Illinois; the William T. Ennor Manufacturing Technology Award; and the ASEE Centennial Medallion.

John C. Chato died November 2, 2010 at his home. He was 80 years old. Chato joined the faculty of Mechanical and Industrial Engineering in 1964 and served the department and the university until his retirement in 1996. Following his retirement, he remained active in the alumni board and often attended departmental events. Chato was instrumental in establishing a campus-wide bioengineering program at the university and served as the first chairman of its executive committee. In 2001, he and his wife established the John C. and Elizabeth J. Chato Award in Bioengineering to honor outstanding undergraduate students engaged in activities related to bioengineering. Born in Budapest, Hungary, Chato earned his master's in mechanical engineering from the University of Cincinnati, and then added a master's degree in mechanical engineering at Illinois and a Ph.D. in mechanical engineering and math from MIT. He was a professor of Mechanical, Biological, and Nuclear Engineering at Illinois from 1964 until retiring in 1996. Chato was world-renowned in his field, received numerous awards, and published multiple articles. He particularly enjoyed his work with graduate students, which continued well into his retirement.

Marlyn Earl "M.E." Clark, professor emeritus of Theoretical and Applied Mechanics, died November 18, 2010. He was 88 years old. Clark taught and conducted research in the area of fluid mechanics and bioengineering. He retired in 1992 after 44 years of service. Much of his research focused on the fluid mechanics in the human cardiovascular system. His research on cerebral blood flow in the Circle of Willis led to the development of a computer simulation that models cerebral circulation. He was also president and co-founder of the Genesis Research Laboratory in Urbana, a nonprofit group that studied the Genesis flood using engineering principles and computer simulations. Clark earned his bachelor's degree in civil engineering at the University of Wisconsin (1944), and his master's degree in theoretical and applied mechanics at Illinois (1948). In the 1980s, he was active in the American Society of Civil Engineers' Committee on Bioengineering, and for many years he provided Pitot-tube calibrations for industry. He advised or co-advised several doctoral students.

Richard E. ("Dick") DeVor, College of Engineering Distinguished Emeritus Professor of Manufacturing, died July 26, 2011 at his home in Lake Mills, Wisconsin. He was 67 years old. Born in Milwaukee, DeVor received B.S. and Ph.D. degrees in mechanical engineering from the University of Wisconsin-Madison. He had served on the University of Illinois faculty since 1971. He was elected to the National Academy of Engineering in 2000, the highest honor for an engineer in the U.S. A dedicated researcher and teacher, he mentored more than 150 M.S. and Ph.D. students who have assumed leadership roles in academia and industry. He received the College of Engineering Everitt Award for Teaching Excellence, the Campus-wide Teaching Award for Excellence in Undergraduate Teaching, and the College of Engineering Halliburton Engineering Education Leadership Award in 1989. He also received the Society of Manufacturing Engineers Education Award in 1993 and the S. M. Wu Research Implementation Award in 2010. Professor DeVor was a former president of the North American Manufacturing Research Institution of the Society of Manufacturing Engineers. He was a Fellow of the American Society of Mechanical Engineers and the Society of Manufacturing Engineers.

In 1961, more than 40 years before the invention of YouTube and the popularity of distance learning, Thaddeus Elsesser (with fellow TAM Professor Harry R. Wetenkamp) made the innovative videotaped course dubbed the "Thad and Harry Show."

Thaddeus Musser Elsesser, associate professor emeritus of Theoretical and Applied Mechanics, died April 16, 2011 in Urbana. He was 87 years old. Elsesser earned his BSME from Illinois in 1945. While still an undergraduate, he joined the Navy reserves at the height of World War II. He served overseas after graduation until 1947, when he resumed studies in TAM at Illinois, completing a master's degree in 1950. He became a TAM instructor, and was promoted to assistant professor in 1955 and then to associate professor in 1959. He retired in 1979. Thad published and consulted in the area of materials testing, and with TAM professor Harry R. Wetenkamp developed an innovative videotaped course in 1961 on behavior of materials—the series was quickly dubbed the "Thad and Harry Show." The tapes were used at UIUC and at other schools, including West Point. He was also among the first UIUC faculty to develop interactive courses on the Plato system.

James L. Leach, Sr. died on August 4, 2010 in Champaign. He was 92 years old. An Illinois all-state football player, "Scrapiron" Leach originally enrolled at Illinois on a football scholarship. After earning a B.S. in mechanical engineering from the University of New Mexico, he returned to earn an M.S. in mechanical engineering from Illinois in 1950, and a Ph.D. in administration from Illinois State University in 1976. From 1946 until his retirement in 1983, Jim served on the mechanical and industrial engineering faculty, including 25 years as a professor and 36 years as the director of the Mechanical Engineering Foundry Laboratory. For more than 20 years, he also provided training and consulting services in the development and improvement of foundry programs around the globe, including in India, Kuwait, Kenya, and Iran. From their home foundry in Urbana, he and his wife worked with local companies, artists, the university, and others in casting unique pieces. He also had a distinguished career in the Air Force, serving as a pre-flight instructor, a pilot during World War II, and a flight instructor, before retiring from the Air Force Reserve as a lieutenant colonel.

Wilbert F. Stoecker, professor emeritus of mechanical engineering, died September 5, 2010. He was 84 years old. Born in St. Louis, Stoecker received his bachelor's degree from the Missouri School of Mines (1948), his master's degree in mechanical engineering from Illinois (1951), and his doctorate from Purdue University (1962). He taught for 36 years at Illinois before retiring in 1984. He received the E.K. Campbell award, the F. Paul Anderson award, and the Richard Kritzer Distinguished Professorship. He was also the author of numerous books, including *Refrigeration and Air Conditioning* and *Industrial Refrigeration Handbook.* He was active in ASHRAE (Fellow and Life Member), IIAR, and IIR. He lectured internationally and promoted global research into new refrigeration systems following the discovery that the common refrigerant freon was contributing to ozone depletion in the atmosphere. It was through his guidance that Illinois' Air Conditioning and Refrigeration Center was first established in the 1980s as an NSF center and later expanded into what has become an international cooperative research effort, with member companies from the U.S., South America, Europe, and Asia.

Edward M. Wu, professor emeritus of aeronautics at the Naval Postgraduate School, Monterey, California, died June 3, 2009. He was 70 years old. Professor Wu was born and raised in Hong Kong. He earned a B.S. in mechanical engineering, and an M.S. and Ph.D. in TAM, all at Illinois. After a short stay at Illinois as an assistant professor in TAM, Wu moved to Washington University in St. Louis, and then went on to Lawrence Livermore National Laboratory, where he set up state-of-the-art laboratories for static and life testing of composite materials in order to support his research on statistical modeling and the quantification of composite reliability. In 1984, he moved to the Naval Postgraduate School to teach and conduct research on computer-aided certification of large critical composite structures ranging from aerospace parts to civilian infrastructure components. He retired in 2001 and continued his consulting work for both industry and government. Wu served on the editorial board of the Journal of Composite Materials and was a member of several engineering societies.

Alumni In Memoriam

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Howard J. Littell, 1/22/2009

1933
Anthony F. Zamis, 12/06/2009

1936
Charles W. Bimba, 11/25/2009

1938
James R. Fletcher, 5/25/2009
James M. Walden, 12/10/2008

1939
Richard P. Molt, 1/07/2010
William O. Odgers, 6/30/2010

1940
Irving H. Alexander, 2/28/2010
John T. Bunting, 6/15/2011
Thomas M. Cross, 10/17/2008
George B. Grim, 2/24/2011
Thomas W. Meisenzahl, 11/25/2008
Carrel B. Morgan, 6/28/2009
Milford B. Morgan, 4/11/2010

1941
Frank W. Hochmuth, 8/05/2009
Robert M. McCreary, 4/07/2009
John D. Nyquist, 1/15/2010
Gardner W. Raistrick, 9/22/2009

1942
James H. Burkhart, 1/20/2010
Lawrence H. Goto, 5/01/2011
John B. Jarman, 1/30/2010
Frank K. Johnson, 11/03/2009

1943
Ralph B. Clark, 4/22/2011
Paul E. Lanferman, 6/02/2011
Dean E. Madden, 9/02/2010
Gust J. Mihal, 10/21/2009
W.K. Peasley, 9/18/2009
Donald C. Ward, 3/03/2010
Will J. Worley, 5/16/2009

1944
Norris W. Carlson, 9/23/2008
E.B. Kleber, 8/31/2010
Edward A. Roberts, 12/29/2008

1945
Lee E. Stickler, 10/20/2008

1946
Ernest M. Hausler, 2/21/2009
Chang K. Liu, 8/31/2009
Douglas O. Wilson, 10/23/2009

1947
Merrill F. Butler, 5/01/2011
Frank W. Foley, 11/03/2008
Perry L. Huie, 5/24/2009
Henry M. Kidder, 4/07/2009
Charles H. McCreary, 1/31/2009
Donald J. O'Brien, 10/21/2008
Howard P. Orlebeke, 7/10/2009
James J. Redmond, 1/14/2011
Donald E. Schneider, 12/18/2008
George F. Schrader, 8/09/2009
Bruce H. Simpson, 11/22/2010
Albert E. Walmsley, 7/08/2010
Paul D. Winchester, 10/14/2009

1948
Edward V. Anderson, 3/13/2011
Frank W. Anderson, 5/09/2009
Richard M. Anderson, 8/14/2008
Henry M. Barkow, 6/04/2011
Ralph W. Behler, 2/20/2011
Marlyn E. Clark, 11/18/2010
Gene Durren, 11/16/2010
John S. Eisele, 3/06/2011
Howard L. Erickson, 3/10/2011
Richard Evans, 5/10/2010
Harold J. Farrar, 7/28/2009
Richard I. Koci, 3/29/2010
William E. McCarthy, 1/09/2011
Thorvald E. Mouritsen, 8/01/2010
Martin C. Sabath, 5/09/2010
Cheng Shih, 10/30/2008
Kunio A. Sumida, 5/12/2009
Fred J. Zatorski, 6/03/2011

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Charles Boetto, 7/16/2010
Hugh G. Brady, 1/09/2011
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Arthur V. Deyot, 6/26/2009
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Ralph A. Andersen, 9/13/2010
Fred P. Cairo, 5/06/2010
Adolph J. Gawin, 7/05/2009
Frederick M. Hugh, 1/25/2011
William F. Jones, 12/22/2009
James L. Leach, 8/04/2010
Charles M. Lubeck, 8/20/2009
Edwin A. Nolan, 7/31/2010
Richard P. Osberg, 5/18/2009
Carl E. Poling, 6/07/2011
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Wilbert F. Stoecker, 9/05/2010
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William D. Jordan, 4/03/2011
Joseph L. Krahula, 9/03/2010
Ronald L. Reisinger, 1/03/2010
Masaki Sugi, 6/10/2010

1953
Edwin S. Levitan, 7/11/2008
Walter I. Nelson, 3/27/2010
Jerry W. Schweiker, 9/28/2009

1955
Avinash K. Ahuja, 6/07/2009
John C. Chato, 11/16/2010
Joseph J. Grass, 10/13/2010
Raymond L. Moser, 6/05/2010
Harold W. Nero, 3/19/2009
John F. Randolph, 6/10/2009

1956
David P. Albert, 10/26/2009
Peter C. Bodett, 12/15/2010
John W. Melvin, 6/20/2011
Robert F. Wagner, 8/05/2009

1957
Richard L. Brunnenmeyer, 11/14/2009
Robert H. Bryant, 01/06/2010
Richard G. Dezelick, 1/24/2011
John P. Holmes, 6/26/2010
Virgil H. Johnson, 4/09/2009

1958
Ross E. Childers, 4/07/2010
James H. Healy, 7/27/2009
Stanley L. Pierce, 5/03/2009

1959
Carl A. Bodenschatz, 12/12/2009
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Louis R. Marchini, 3/18/2011

1960
William C. Biallas, 12/25/2009
Richard Bolton, 4/30/2010
Donald E. Carlson, 8/21/2010
Glenn B. Finney, 1/10/2011
Stephen S. Groves, 5/29/2011
Kenneth M. Jauch, 9/21/2008
Edward M. Wu, 6/03/2009

1961
Samuel L. Britten, 10/04/2009
Robert L. Malcolm, 3/17/2011
Philip A. Trast, 5/28/2010
William F. Waterman, 6/10/2010
David M. Wickersham, 6/01/2010

1962
Carl S. Eckberg, 11/06/2010
Raymond R. Hagglund, 11/30/2010
Elmer E. Reis, 1/23/2010
Mark M. Shamamy, 3/12/2009
Klaus J. Weinmann, 11/03/2010
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1963
Kenneth F. Lindgren, 12/12/2009

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Robert C. Hansen, 8/16/2009
Dale A. Henning, 6/01/2010
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1970
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Hello, MechSE alumni!

Now just a few months into my position as MechSE's new advancement director, I already realize how fortunate I am to work with the talented and motivated alumni, faculty, and students who make up the Department of Mechanical Science and Engineering at the University of Illinois. There is an incredible passion for both the department and the university that they all share. I am so glad to now be a part of it myself!

In almost any setting, it's clear that all of the people involved with a top-ranked program end up benefiting. And in the case of the world-class MechSE Department, that's definitely the case. Our students receive a superior education and end up with better job prospects than those who attend almost any other university. Our professors get to teach the best students, have top labs and facilities in which to work, and carry the clout of working for a world-class institution. And you, our alumni, will always be able to claim that Illinois, and our department in particular, was the institution that launched your career. It's a carrying card that few possess, and you should be proud.

To all of our alumni and friends who have generously supported the Department of Mechanical Science and Engineering through the years, I sincerely want to thank you. Whether this has been through financial donations or through time you have volunteered for us, you are the reason our program continues to flourish. As we look to the future, with top engineering schools continually pushing technology to new heights, I can't emphasize enough that the future of MechSE depends on each and every one of you. Your support is what will maintain the long-term stability and success of the MechSE Department for faculty, students, and research. The size of your gift does not matter nearly as much as just the effort of giving something—with more than 12,000 alumni worldwide, the cumulative effect of many small gifts can make a significant difference.

I am grateful to be working with such a great group of alumni, and I cannot wait to meet you. We plan to stay in touch often, and I look forward to hearing your stories about the department and the university when we touch base. I hope it will be soon.

Best regards,

Chad Rohlfs

Chad Rohlfs
Director of Advancement

Bill Bowman, Betsy Powers, Chad Rohlfs, and Cynthia Coleman

Alumni relations

Bill Bowman is the department's associate director of communications. Please contact him if you have a newsworthy event, a cool project on video, or feedback on the MechSE website, alumni magazine, or any of our other communications efforts. **wbowman@illinois.edu**

Cynthia Coleman is the department's associate director of external relations. She serves as a liaison for corporate entities interested in deeper engagement with MechSE. If you see potential for a partnership between your company and MechSE, Cynthia would welcome a conversation to explore these possibilities. **ccoleman@illinois.edu**

Betsy Powers is the department's coordinator of alumni and student relations. Feel free to contact Betsy to update your contact information, if you have interest in organizing an alumni event in your area, or with any questions you have regarding MechSE. **epowers2@illinois.edu**

Chad Rohlfs is the department's director of advancement. He works closely with MechSE alumni, facilitating their campus visits, making trips around the country to stay in touch, and coordinating volunteer service and philanthropy. Please contact Chad with any ideas you have for strengthening MechSE's alumni relations or for ways to give back to the department. **crohlfs@illinois.edu**

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