Inside:
ME Undergraduate Scholars
Dear Alumni and Friends:

It is my great pleasure to update you on the significant progress the department has made over the past six months.

Let me start out with a piece of very exciting news. In October, the National Research Council (NRC) released the results of its decadal assessment of doctoral research programs. While there are several groups and news media performing “rankings” of departments, the NRC assessment is widely considered to be the most authoritative one, since it is the only study that is based on actual performance measures of graduate programs. Hence it is with particular pride, that I inform you that our ME doctoral program placed 7th out of 127 programs nationwide according to its marks in the NRC’s overall “regression-based” ranking. This assessment followed a similar methodology as the 1995 NRC report, which ranked our program 8th in the nation in mechanical engineering. Our continued high standing is a strong testament to the excellence of our faculty and the talent and dedication of our graduate students. It reflects our commitment to lead the nation in educating tomorrow’s leaders in the mechanical engineering profession.

The continual upgrade and improvement of our teaching and research facilities is an important priority for maintaining our standing and reputation. While the new Mechanical Engineering building, which was dedicated in April 2001, has made a significant impact on our teaching and research activities, more than 70% of ME’s research and teaching space is located in the old Mechanical Engineering building, which was completed in 1949. The recent installation of fire alarms and sprinkler systems in this building was a welcome upgrade—given that ME operates an engines lab with combustible fuels on the 4th floor. Yet, these measures are just a first step in the much needed renovation of old ME, which we hope will make the space more useable and safe. We are pleased that ME received grants totaling $2.1 million to commence with renovations of some of the laboratory and shop space. A pre-design study for the renovation of the entire old ME building will get underway in February 2011.

Hiring outstanding teachers and researchers is another crucial element of improving the department. This fall semester, ME welcomed Professor Rusen Yang as its latest addition to its faculty. Professor Yang joined us from Georgia Tech University, where he worked on nanomaterials for energy generation in biological systems. His expertise will add a new dimension to our activities in design and manufacturing and medical devices. I am also pleased to inform you that the department is again searching for three new faculty members to augment our teaching and research in the areas of powertrains and engines, environmental research, and medical devices.

Finally, student support is an important piece for recruiting the most talented and gifted undergraduate and graduate students. I am pleased to report that with the strong support from alumni and friends, ME was able to provide scholarship support to 34 undergraduate students and make fellowships to 21 graduate students. In this issue of ME News, you will meet some of our outstanding scholarship winners. On behalf of our faculty, students, and staff, I want to sincerely thank all of our donors for supporting some of our most outstanding future intellectual and technical leaders and for helping the ME department pursue its mission of excellence.

Uwe Kortshagen
Distinguished McKnight University Professor and Head of Mechanical Engineering
**Accolades and Awards**

**Research Assoc. Prof. Craig Shankwitz**
won the Management Innovation Award from the Minnesota Public Transit Association for his work on the bus driver assist system, part of the US DOT’s “Urban Partnership Agreement” grant to Minnesota transportation agencies. Improving schedule reliability and helping drivers feel confident when using bus-only shoulders on suburban highways are two of the goals of the Driver-Assist System (DAS) currently being implemented by the Minnesota Valley Transit Authority (MVTA) in Burnsville, MN.

**Professor Jennifer Alexander**

**Professors Perry Li and Terry Simon**
received a research grant from the National Science Foundation (NSF) to develop a “Novel Compressed Air Approach for Off-Shore Wind Energy Storage.” The four year, $2 million award is made through the Emerging Frontier in Research and Innovation (EFRI) and the Grant Opportunities for Academic Liaison with Industry (GOALI) programs.

The investigators of the research are: Perry Li (PI) and Terry Simon (Co-PI) at the University of Minnesota, Eric Loth at the University of Virginia, James Van de Ven at the Worcester Polytechnic Institute and Oakland California based industry partner, Lightsail Energy.

The research proposes to develop a localized method for storing off-shore wind energy before conversion to electricity in high pressure compressed air vessels. In addition to allowing the storage of wind energy during periods of low demand, the concept will achieve load leveling so that components can be down sized for average instead of peak power. The concept makes use of the comparative advantages of hydraulics and pneumatics in a so called “Open Accumulator” architecture, and an isothermal air compressor/expander design. The interdisciplinary research involves fluid flow, heat transfer, machine design and systems and control.

**Professor David Pui** was named President of the International Aerosol Research Assembly. At their conference in Helsinki, Finland on August 29, Dr. Pui received the Fuchs Memorial Award, the highest aerosol award.

**Professor Zongxuan Sun** and Dr. Shih-Ken Chen are the guest editors for the special issue of IEEE Control System Magazine on "Automotive Active Safety Systems." **Professor Rajesh Rajamani's** work on tire road friction coefficient estimation was featured on the cover of the special issue.

**Tianhong Cui** was promoted to the rank of Professor in August, 2010. Professor Cui heads research in micro/nano electro mechanical systems, nanomanufacturing, and flexible electronics.

**Professors Jane Davidson and Wojciech Lipiński** along with Professor Sossina Haile at Caltech and Professor Bruce Dunn at UCLA have been awarded an NSF Emerging Frontiers in Research and Innovation grant entitled, "Thermochemical Routes to Efficient and Rapid Production of Solar Fuels." The objective of this project is to transform and expand the nation’s renewable energy storage capacity using a thermo-chemical approach for converting the energy of photons into chemical bonds.

**Professor Terry Simon** has been appointed Editor of the ASME Journal of Heat Transfer for a term of five years.

**Professors Tom Kuehn and James Ramsey**, with Bernard Olson, PhD, and Josh Rocklage, received a Best Paper Award from ASHRAE for "Grease Particle Emission Characterization from Seven Commercial Kitchen Cooking Appliances and Representative Food Products." The award was presented at the ASHRAE Annual Conference, June 26, 2010.
Homecoming 2010 in Mechanical Engineering included a visit from Goldy, faculty presentations, lab tours, and a reception hosted by the Mechanical Engineering Alumni Network and the Department.

Following these events, the College of Science and Engineering held a picnic on the plaza of the McNamara Alumni Center. A Pep Fest and parade on University Avenue completed the evening’s events.
Assistant Professor Rusen Yang joined the department this fall. His research is in the emerging field of energy harvesting nanotechnology. Mechanical energy can be converted into electricity with piezoelectric nanomaterials (nanogenerators). This research adds to the departments focus on alternative energy and nanotechnology.

Professor Yang is originally from a small village in rural China, called Zhifangzhen. His parents were farmers. As a child he possessed an innate inquisitiveness about natural phenomena, like weather and lightning. He was also curious about what things were like beyond the mountains surrounding his hometown. He knew he would have to study hard and go to the university if he was going to be able to travel.

As a child he took advantage of the used book sellers that came to his village, buying many introductory science books for small change. Those books helped him to decide early on that he wanted to be a scientist. Said Yang, “I didn't really know what a scientist was, but I knew they discovered things, and invented things, like motorcycles and tractors, and also knew it would be fascinating and challenging.” A high school physics teacher helped further his interest in science.

At Jilin University in northeastern China, he received his Bachelors and Masters degrees. In his fourth year of college he worked on a research thesis for his Bachelors degree. His advisor, Professor Bingbing Liu, introduced him to the field of nanotechnology, working with nanomaterials. They invented a new approach to grow single-walled carbon nanotubes. They also worked with electron microscopes that enabled them to see at the nano scale. That laid the groundwork for his current research.

Yang wanted to continue his graduate studies in the United States, not really knowing what to expect, except that the U.S. was “very advanced in science and technology.” He attended the Georgia Institute of Technology in 2001 and started extensive study in the area of nanoscience and nanotechnology with Professor Zhonglin Wang. He has created variety nanostructures from ZnO, SnO$_2$, Zn$_3$P$_2$ and other materials. Later on he engaged in the research of energy harvesting with the piezoelectric nanomaterials. His research even enabled a hamster to generate electricity! He received his Ph.D. from the Georgia Institute of Technology in 2007.

Professor Yang is married with two young sons. He enjoys sports and plays badminton. His impression of the Twin Cities? “So far so good,” he said. He really enjoyed the fall colors in Minnesota, and is looking forward to snow. Being no stranger to cold weather, he is anxious to try cross-country skiing with his family.

[The picture shows a nanoscale energy harvester from Professor Yang’s research. It contains a ZnO nanowire fixed to the surface of a polymer substrate. When the substrate is bent, the nanowire will be stretched and generate electricity due to its piezoelectric property.]
**Katherine Black** is a senior in mechanical engineering. Raised in Grand Rapids, Minnesota she started her engineering program at Itasca Community College. Why engineering? “My first year at Itasca Community College, I took Calculus I just for fun. The teacher for the class, Ron Ulseth, approached me one day and mentioned that I was doing well in the class and I should consider engineering for a major. Ron Ulseth is the unofficial leader of the engineering program at ICC. I went on one of those ‘career choosing’ websites and found out that engineering had everything I wanted in a career.

Black enjoyed the smaller school experience – being on a first-name basis with her teachers and classes of about 30 students. But after two years at the community college, she transferred to the Twin Cities campus. Black welcomed the full spectrum of opportunities offered here, including working in a co-op for two semesters, being part of the solar vehicle project, and the career fairs held twice a year. She finds that even though the University is large, she still has been able to get to know her professors - she has gotten to know Professor Tom Chase who is teaching Design and Manufacturing II, and is also her advisor.

She also joined the co-ed, professional fraternity, Theta Tau, where she has been involved with hosting events and professional development programs. Recently the fraternity hosted a Founders Day formal dinner and invited alumni back to visit their old house. The event led to interesting exchanges and networking with alumni and students comparing their school experiences.

Being a top student Black has received an ASHRAE scholarship, Blandin Foundation scholarship, and several ME scholarships. Her preferred area is in design and manufacturing, but she also enjoys the thermal sciences. “You get the math and science side along with the creative and design side all rolled into one. I chose mechanical when I came to the U because it’s so broad and I can do so much with a mechanical engineering degree. I’m really glad I did because I’ve come to love my classes and teachers,” she said.

And after graduation in the spring? “I am leaving my options open,” she said. “I went to the Career Fair and handed out a couple applications and had some interviews. If I get a job that I’m really interested in then I will go that route. If not, I might continue on to graduate school.”

**David Hong**, a senior mechanical engineering student, is anxious to enter the working world. In addition to his engineering studies, he has minored in business management and did three study abroad programs during his 4-year program. The first was a three-week trip to Beijing and Shanghai with a Carlson professor and a group of students from the U to learn about the economics of manufacturing things in China and shipping them around the world. The second program, also a three-week trip with a Carlson professor, took place in Buenos Aires, where the group learned about marketing new products in foreign cultures.

The third study abroad was a semester long program in Gothenburg, Sweden. He studied at Chalmers University of Technology, where the graduate program courses are taught in English. He was able to take Master’s level courses with students from all over the world, and transferred these courses as tech electives.

Hong has a history of being ahead of the curve. He went through UMTYMP (pronounced um-tee-ump), the University’s Talented Youth Math Program, which takes high school students through a series of honors courses in math, in Hong’s case, honors calculus, during grades 9 through 11. When he came to the University he had already satisfied his math requirements.

He has high praise for the CSE Honors Program. He went through the physics sequence with Professor
Crowell. “It was just wonderful. It was the first under-grad course he had ever taught, so the level was quite high and he had very high expectations for us. I learned so much in those three semesters, not only about physical concepts, but how to think technically in general,” he said.

Hong grew up in Plymouth, Minnesota and his parents are business people – ‘accountants and such.’ But he was on his own in math by 7th grade. His interest in engineering grew out of reading car magazines as a teenager: “I started thinking about how cars work and the components and the physics behind them. By the time I was in high school and had taken a physics course I knew it would be engineering,” he said.

His interest in cars led him to work with Professor Kim Stelson in the Center for Compact and Efficient Fluid Power, “We are researching new hybrid vehicles that use hydraulics to compress nitrogen gas instead of storing energy in a battery.” This research will make up his honors thesis.

“I really enjoy mechanical engineering because it’s got an analytical aspect, but I can also visualize the concepts; I can easily conceptualize the stresses and strains. I really enjoy that,” he said.

**Emily Hoskins**

graduated with a B.S. degree in ME this past spring. She is employed at Emerson Process Management - Rosemount in Chanhassen where she is a manufacturing engineer working with pressure transmitters. But before settling into that first job, and paying back all those school loans, Hoskins was part of a global organization that brings engineering solutions to those that desperately need them.

That organization is Engineers Without Borders (EWB). She joined the group at the end of her sophomore year and for the next two and a half years participated in meetings, learning and planning for projects in Uganda. “I am not sure why Uganda was so interesting to me,” she said, “but before I knew it I was having tasks assigned to me, and was working on it six to eight hours per week.”

She worked on the project all of her junior year, and that summer took her first trip to Uganda. That summer they utilized a groundwater source near a school, the Hope Integrated Academy in Kyetume. The school was new and growing rapidly. It had already outgrown the rainwater harvesting system that had been implemented by EWB the year before. They hired a company to dig a borehole for them, dropped in a submersible pump, powered by solar panels, which now provides enough clean water for sixty to seventy students. Most of the students live without clean water or sanitation in their homes. Now they had water, sanitation buildings and other public health initiatives in place, but EWB wanted to do more for the larger community.

They looked at many options and finally chose to work on two projects; providing fuel efficient, smoke-reducing stoves, and a micro-irrigation system which is much needed during the dry season. Smoke from cooking fires results in a high rate of blindness and respiratory diseases among women and children, who spend a lot of time around the fires, which provide heat and light, as well as cooking. Getting the women to buy into using the new way of cooking required helping them understand the health benefits of using the stoves. EWB volunteers in public health provided a whole curriculum with demonstrations about how smoke affects the lungs.

Hoskins was the lead member of the micro-irrigation project. A tripod supports a bucket of water, with flexible piping leading down into the garden bed. Small holes in the pipe provide water just where the seeds are,
reducing water consumption. “Showing them efficient water techniques and the importance of protecting their resources – that they need to be responsible - was so important,” said Hoskins.

All EWB projects have a professional engineering mentor working with them. This year the group’s mentor throughout the school year could not travel, so they sought out Professor Jane Davidson. “We approached Professor Davidson in April and asked her if she wanted to go to Uganda,” said Hoskins. After explaining how, what, and when, and a crash course on their projects, she was on board. “She immediately gave us good feedback, and helped make a large number of engineering decisions,” said Hoskins. Davidson said, “Working with Emily and the other University of Minnesota students in Uganda was a highlight of my professional career. I was honored to be part of this global initiative and to work with such talented and caring students as well as with the Ugandans who are striving to improve their community. It was also quite the adventure!”

The EWB members were in Uganda for three weeks. Their group consisted of six engineering students, two public health students, one global studies student, and one Humphrey Institute student. Said Hoskins, “The thing I enjoyed most about going back this past summer was seeing all the kids again. Also, going back and seeing our system still running, and it helping them so much.”

What about that chicken? “While we are there the family cooks for us – all of our meals – twice a day. And they are always cooking for us. So we thought let’s make a meal for them. We decided to make chicken tacos. So one of the students and I went to the market to buy a chicken. We finally agreed on a chicken and they spent about ten minutes trying to catch it. We carried it home, and we had a student kill it and butcher it. And then we plucked it, and deep-fried it in oil. We served it with a bread they call chapatti – it’s like nan or pita, and we put the chicken in with avocados and tomatoes and they said they liked it. I think we could feed them anything and they would say they liked it – but I think they really did.”

About the ME program: “I think the problem solving process is what I value the most. When I was over there, and in my job now – it is not about the fluid dynamics or the heat transfer, but skills for solving problems that are presented to me. I think the University did a really good job teaching that with their curriculum. I really appreciate that - it makes my job much easier now, knowing how to approach things.

The future: “I definitely want to go back for some type of schooling, but more importantly, I want to use my engineering skills to actually help people. I will definitely do trips like this my whole life.”

Lauren Butler, a senior, traces her interest in engineering back to a childhood playing “Inventor” over “house.” She has always liked math. “I think I was meant to be an engineer,” she said. She likes the problem solving aspects and practical applications. But there is an artistic side to her as well - she is also completing a major in dance.

Calling on that artistic talent, the College of Science and Engineering recruited her for a special event in honor of the college’s 75th anniversary. Butler was asked to choreograph a “flash-mob” (defined in Wikipedia as a large group of people who assemble suddenly in a
public place, perform an unusual and pointless act for a brief time and then disperse). Butler created a dance routine that was performed by over 100 students, faculty and staff on Northrop Mall on October 19, 2010 and videotaped. View the performance at: www.youtube.com/umnCSE.

Working on a double major has not stopped Butler from another time-consuming endeavor; being involved with Engineers Without Borders. Starting in her freshman year, she is currently serving a second year term as president of the Minnesota Chapter. “Obviously, I love it,” she said. Butler has made three trips to Guatemala where they are working on a rainwater-harvesting project, and a spring water distribution project. “We go for about two weeks each time, and this project will continue for several more years,” she said. She finds the hands-on work of these projects motivational, “Learning something in class, say, Brunelli’s equation, and then actually using it to design tubes for a water system the next semester – that’s been really cool.”

Butler at work in Guatemala

Butler also cites learning to work as a team with students from various disciplines a benefit of the program, “we all have very different ways of thinking about things, like a specific problem solving method. But we work together to learn what the users (the community members) need, do background research on what others have done to address the problem, and then come up with our own ideas, create design matrices, and get outside input to determine the best solution. That innovation process is really fun.”

In the first phase they designed a concrete tank, which was placed underground to store the water. They designed the gutters and piping to take the water to the tank, the filtration and chlorination systems, and distribution to areas within the school. Professional engineers review the designs and make sure everything is up to code. Now that the school has a reliable water system they are looking at how they can update the water distribution system for the village.

They involve the village residents from the very beginning, from assessing the needs, what assets they have, to brainstorming ideas, giving feedback, and finally with making a decision on what to do. “They are working right beside us on each step of it,” said Butler, “from procuring the materials to providing labor.”

Funding comes from EWB, but the community also contributes to the project. “Mostly raw materials, sand or gravel, and always in the form of labor, and then usually a small amount of money. For this upcoming section of the Guatemala project they are putting in 10% and we are paying 90%. There are also students in EWB who work during the year fundraising for the projects,” explained Butler.

What is next for Butler? “I would like to go to graduate school at some point. I think I would prefer to do it after working for a while. I love the work I do with EWB, so if there was something I could do like that I would love to.”
About this time last year, a small group of Mechanical Engineering Alumni with the help and support of the faculty and staff of the Mechanical Engineering Department, formed the Mechanical Engineering Alumni Network (ME-AN). The stated goals of last autumn remain the same: to provide an environment of support for the students, faculty and staff of the ME Department, promote lifelong social and professional relationships, support ME students in their academic and social pursuits and develop a legacy organization that will work closely with the Department in all of its endeavors. It’s a year later and nothing has changed, except the number of alumni that are participating is steadily growing. We are continuing to find strong interest in our activities from all classes and all ages and hope to perhaps fill a void that may have existed.

Our first event of the school year took place on Homecoming weekend and was well attended, very interesting and a lot of fun. If you weren’t there, put it on your calendar for next year. You won’t be sorry. This year’s events started on Friday afternoon with a series of short presentations by some of our faculty, tours of the working laboratories and a “picnic” dinner hosted by the college at the Rec Center. That was followed by the Homecoming Parade and Pep Rally at TCF Stadium. No need to discuss what happened on Saturday. We will host two or three more events this year and I encourage everyone to stop by. All of these events are interesting and you may run into someone you went to school with, which is always a plus.

We still have plenty of room for anyone that is interested in getting more involved in ME-AN. Workloads are very flexible and undemanding. Showing up once in a while goes a long way. Whatever your interests and time, we are happy to accommodate you. We are looking forward to another rewarding year and have room for everyone. Thank you for your support and enthusiasm.

If you have questions, please feel free to email me at alumni@me.umn.edu. Please join us for the next ME-AN alumni event on Thursday, November 18th at 7:00 PM in Mechanical Engineering Seminar Room 1130. The University’s Solar Vehicle Team will be presenting an update on their 2010-11 efforts. I hope to see you there.

Jim Rutzick
ME-AN Leader

Join the Mechanical Engineering Alumni Network. Make connections with other alumni who share an interest in learning, mentoring, and networking.

Contact Jim Rutzick, email: alumni@me.umn.edu, or Kent Larson, on LinkedIn - Mechanical Engineering Alumni Network - University of Minnesota (TC).

Also visit www.me.umn.edu/alumni/ for more information and upcoming events.

Mark your Calendars! Two public lectures for ME alumni and friends:

November 18, 2010
7:00 PM, Room 1130 Mechanical Engineering
Solar Car Project

February 15, 2011
Professor David Kittelson
Potential of Modern Internal Combustion Engines
Details: TBA
In Memorium

David L Anderson  BME 1968  September, 2010
Allan N Anderson  BME 1946  January, 2010
Robert F Asleson  MSIE 1958  July 22, 2010
John J Beck Jr  BME 1950  July 18, 2010
Anna Ruth Belisle  Donor  April, 2010
Franklin T Bell  Donor  2010
Marvin F Bendzick  BME 1942  July 29, 2010
Minnerd A Blegen  BME 1948  June 29, 2010
Paul R Brinson  BME 1967  February, 2010
James W Clark  BME 1950  June, 2010
Gordon R. Condit  Donor  January 6, 2010
Phyllis B Conrad  Donor  July, 2010
Byron B Davis Jr  BIE 1956  February, 2010
Oscar G Frykman  MSME 1948  May 29, 2010
Dale J Hagen  BME 1949  August 27, 2010
Robert A Halberg  BME 1956  March, 2010
Robert A Hill  BME 1953  June, 2010
Kenneth A Johnson  BME 1945  January 23, 2010
Earl C Juhl  BME 1949  March, 2010
Robert B Kinney  PhD 1965  March, 2010
Melvin J Koski  BME 1962  September 21, 2010
Philip J Lesch  BME 1959  June, 2010
Lloyd E Lundahl Jr  BME 1947  March, 2010
Sue H Makredes  BME 1983  April, 2010
Arnold C Matthies  BME 1937  April 1, 2010
Dean S Monitor  BME 1950  January, 2010
Robert E Mueller  BME 1943  March 31, 2010
Robert W Nelson  BME 1949  July 1, 2010
Ronald T Oshima  BME1958  May 28, 2010
Edward D Pierson  BME 1939  August 14, 2010
Rowland Retrum  BME 1939  July 24, 2010
Paul N Roelike  BME 1980  February, 2010
Roger M Ruppert  BME 1949  August 22, 2010
Lois Ann Rustin  Donor  April 3, 2010
Michael G Savage  ME 1968  February, 2010
Elizabeth A Severson  Donor  February 12, 2010
Sam J Stewart  BME 1959  May, 2010
William E Tessmer  BME 1952  August 25, 2010
Stanley C Tingquist  BME 1943  March 3, 2010
Howard E Wallin  BME 1949  March 20, 2010
David B Wamstad  BME 1953  February, 2010
Patricia K Yip  Donor  March 8, 2010
Philip A Zoubek  BME 1943  March 30, 2010

The College of Science and Engineering is celebrating its 75th year with events and banners like this one - a window cling - placed at the entrance to Mechanical Engineering. The banners have been generously donated by 3M.

Follow us on Twitter

Follow us on Twitter at twitter.com/umnme for the latest news and events. We welcome your feedback and suggestions.
Upcoming Public Lecture

This past June, the University’s Solar Vehicle, Centaurus II finished second overall in the American Solar Challenge - an 1100-mile race from Tulsa, OK to Chicago, IL. The team also brought home two additional awards, the sportsmanship award for the third consecutive time, and the electrical excellence award for the car's reliable and well-designed electrical and electronic system.

Meet some of the team members and hear how they built this winning car at the upcomming ME-AN Public Lecture on November 18th. The lecture will take place in Mechanical Engineering Seminar Room 1130 and begin at 7:00 PM. All ME alumni, family and friends are invited.

We look forward to seeing you!