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ENGINEERING @ NEBRASKA

FALL 2008



BUILDING PARTNERSHIPS

ALSO INSIDE:
ZERO NET ENERGY TEST HOUSE
MAKING THEIR MARK ON MARS



FROM THE DEAN >

Generating more women in engineering at UNL

Let's talk about women in engineering.

I'm sure most of you have already heard from sources such as Thomas Friedman's book, *The World Is Flat*, that the United States faces a grand challenge within technical disciplines in the century to come.

These issues are particularly important to the state of Nebraska as well. We in higher education are focused on our responsibility to meet the needs of the state in the technical disciplines, particularly with respect to producing new intellectual property for the state.

What we know is this:

The state of Nebraska lags behind the national average in production of engineering degrees by about 13 percent. The low enrollment of women in the College of Engineering, which is a trend across the nation, significantly adds to this challenge.

Now that you know that we recognize this challenge, you may say, "Great—it will get solved." But as we all know, recognizing the problem is only 10 percent of addressing the challenge. Here's what we're doing to solve the other 90 percent of the matter:

- The University of Nebraska-Lincoln has recently obtained two new, large NSF educational grants focused on attracting female students and faculty, as well as people of color.
- Furthermore, we are providing broad educational opportunities that are of particular interest to female students, such as minors in international and biomedical engineering.
- We are also focused on extracurricular activities for women, such as the Society of Women Engineers.

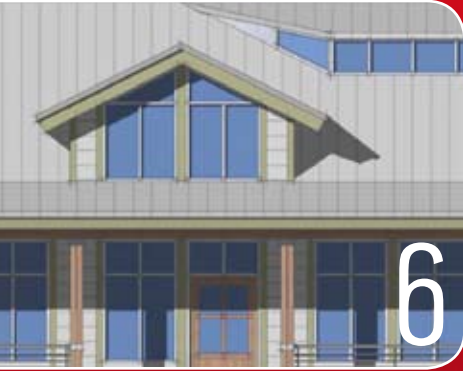
It would be presumptive to assume that these efforts will completely solve the problem. But we can make you this promise: we will continue our efforts to enhance opportunities for women in engineering, in order to meet the needs of Nebraska and our nation.



David H. Allen
—David H. Allen



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ON THE COVER: Nebraska Engineering students Caleb White, a freshman majoring in Civil Engineering, and Craig Colwen, a freshman majoring in Construction Engineering, work together on a memorable building experience at the ZNET House in Omaha.



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MASTERS' WEEK: MECH GRAD, OIL INDUSTRY CEO OFFERS VIEW FROM A MOUNTAINTOP

Joe Bryant wanted mountains; instead he got the world. He grew up in Lincoln, one of six children: five of whom became engineers. (When the Bryant siblings considered careers, the only question in their father's mind was, "Civil or mechanical?")

Bryant worked as a brakeman for BNSF during college and seeing all those coal trains likely primed him for a career in energy. After graduating from UNL in 1977 with a B.S. degree in mechanical engineering, he worked for Amoco in Wyoming. With several good discoveries during his watch, Bryant moved up the corporate ladder to Denver and then higher positions overseas, which prepared him to become president of Amoco. The oil company merged with Unocal, and he led the organization during negotiations when China wanted to buy the company as its national oil operation.



Joe Bryant (left), founder and CEO of Cobalt International Energy, returned to the College of Engineering for UNL Masters' Week in November 2008. Bryant earned his bachelor of science degree in mechanical engineering in 1977. In classes and lab tours, he met with faculty and students, including graduate student Nate Wood in the robotics lab.

In 2005, Bryant started Cobalt International Energy, a smaller but more nimble company that focuses on drilling in the Gulf of Mexico and West Africa, as well as acquiring liquid natural gas and transporting these products.

During the November 2008 UNL Masters' Week, Bryant's inner mechanical engineer shone through as he told an ME 370 (Manufacturing Methods and Processes) class about how the oil industry's huge supertankers were built in the world's largest dry dock at Ulsan, South Korea. He discussed geologic factors with the ME 420 (Heat Transfer) class. And in an afternoon Q&A session with ME students, faculty and staff, Bryant shared a wealth of industry experience and insight.

On engineering: "Engineering is the most powerful degree. You get the basic tools to do anything." But engineers cannot be passive with their capabilities. "Your children are going to live in the world you leave them."

On the oil industry: time is money—with tanker and refinery operating costs, a lost day wastes millions of dollars—but human life trumps all. When Hurricane Ike struck the Gulf of Mexico this year, Cobalt safely evacuated its rigs and hoped for the best with its equipment—some of it reaching more than 25,000 feet down through the ocean. Despite the strength of the rig's anchoring system, built to bear 80-foot seas with 12 steel ropes that are each three to five inches thick, one rig was blown 60 miles from its original location.

On the future of energy and the economy: "The U.S. can be energy independent, but not oil independent ... we import more than half of our oil and there's nothing on the horizon to really stop that trend." Consider that when you fill the 20-gallon tank of your car, only eight of those gallons come from U.S. resources; to combat dependence, you must either stop using the other 12 gallons or find ways to make the eight more efficient.

Bryant expressed few regrets—mainly, not going for an MBA degree—but he hasn't missed much. He believes, "It's not about the degree but how you expose yourself to the opportunities in front of you." And he understands the bigger picture: "Early education is fundamental to engineering which, with technology, fuels industrial development—essential to economic growth. Together they are the early indicators for any nation's future economic prosperity."

HOHNSTEIN GIFT OPENS NEW FACILITY

The college dedicated the Hohnstein Conference Room on July 21 in Nebraska Hall. Nebraska native E.L. "Roy" Hohnstein, B.S. CIVE '51, died in 2006 at age 78; at the ceremony he was remembered as an expert civil engineer with strong skills and ethics. His \$1 million bequest was applied to renovate facilities for the college's Nebraska Transportation Center and Mid-America Transportation Center, and to generate scholarships for students pursuing civil engineering studies with Nebraska Engineering.

ENGINEERING MECHANICS HOSTS FRENCH FACULTY

The Department of Engineering Mechanics has hosted a series of visiting French faculty who have given talks for the Nebraska Engineering community. The guests include: Dr. Anthony Bunsell, of the Ecole des Mines de Paris, France; and Dr. Jean-Marc Saiter, Dr. Williams Lefebvre, and Dr. Laurent Delbreilh, all of the Universite de Rouen, France. Nebraska Engineering offers a simultaneous dual degree program with one year at UNL for a Master of Engineering Mechanics and one year at the Universite de Rouen for a Master of Materials Engineering.

FOR TEACHERS, A "FAIRY GODMOTHER" WHO WEARS A LAB COAT

Making math and science engaging for middle and high school students can be a challenge, but with a UNL partnership helping the transformation, the results can be magical for all involved. This summer, the Professional Development Science and Math Summer Technology Institute entered its third year of inspiring technology learning that benefits Nebraska classrooms.

Part one of this year's summer institute gathered dozens of teachers from middle and high schools throughout the state. They met experts from transportation systems and electrical engineering during guided lab and simulator tours on campus. They also gained time and tools, including mentoring and networking, to apply all this to curriculum for their math and science classrooms.

The Nebraska Transportation Center, part of the College of Engineering, worked with the Nebraska Center for Research on Children, Youth, Families and Schools to develop this two-part program, which also included a campus visit by students in July. The Summer Institute is funded in part by the Nebraska Coordinating Commission for Post-Secondary Education and the U.S. Department of Transportation.



BRIGHT LIGHTS SHINES

In mid-July, 24 middle school students sampled a brilliant buffet of engineering feats and treats at the College of Engineering. This 12th year of Lincoln's Bright Lights program at the college might have been themed "design and conquer," as it served up classic science curriculum (building edible cars) with a few new twists (soldering "lie detectors" from small circuits).

Throughout the week, the budding scientists posed questions to professors and grinned with grad students over the successes and failures of robots tying shoelaces. The youngsters stacked their own food pyramids during a day focused on agricultural and biological systems engineering, and their oohs and ahhs echoed during tours of the supercomputer complex and transportation crash test site.

Bright Lights lived up to its name by illuminating several subjects: from Nebraska-born electrical engineer Harold Edgerton's strobe method photography to the intense colors of infrared imaging.

WIIE FOCUSES ON THE FUTURE

"Women Interested In Engineering" is more of a state of mind than just a single calendar day. But on Sept. 20, nearly 50 female high school students took time from their schedules to get hands-on at Nebraska Engineering.



CELEBRATIONS

COMPUTER SCIENCE AND ENGINEERING: 40 AND FABULOUS

Moore's Law, about the exponential growth of technology, clearly applies to UNL's Department of Computer Science and Engineering. CSE's 40th anniversary this fall highlighted accomplishments among the program's people and facilities.

Richard Sincovec, Henson Professor and Chair of the Computer Science and Engineering Department, gave the keynote address on Sept. 25. A reception and dinner followed at the Champions Club, with inauguration of the Nebraska Hall of

Computing to recognize the outstanding industry and academic contributors to computing.

The next day, faculty, students, alumni and guests enjoyed a talk by Jeff Raikes, former president of the Microsoft Business Division, now CEO of the Bill and Melinda Gates Foundation. Distinguished speakers Tom SeEVERS of IBM, Mark Tuttle with Intel, and Michael Sump, retired from Texas Instruments, added insight.

Later that afternoon, Chancellor Harvey Perlman presided at the dedication of the new June and Paul Schorr III Center for Computer Science and Engineering. Tours featured UNL's Research Computing Facility and the Jeffrey S. Raikes Honors Program in Computer Science and Management (formerly the J.D. Edwards Program).

CSE alumni were also invited to the Schorr Center for a pre-game event before the Nebraska-Virginia Tech football game on Saturday.



Chancellor Harvey Perlman (center) presented the Schorr family with a framed photo of the facility their gift made possible.

ALUMNI AND INDUSTRY ACCOLADES MARK AE10 EVENT

"There is not a better [AE] program than this one," an industry panelist said at the UNL Architectural Engineering program's 10th Birthday Celebration on Oct. 6. Several hundred alumni, industry representatives, faculty, staff and students of the AE program and The Durham School attended the reception and panel discussions at The Peter Kiewit Institute in Omaha.

The AE alumni panel included Stephanie Guy, '05, DLR Group; Adam Christiansen, '05, Larson Engineering; James Wingert, '07, HDR; Matt O'Boyle, '06, HDR; Toby Samuelson, '04, Farris Engineering; Doug Nelsen, '06, Leo A Daly; Ryan Curtis, '06, Leo A Daly; Ryan Pelster, '04, Performance Engineering; Jamie VanRoy, '03, Schnackel

Engineers; and Shaun Nienhueser, '08, Farris Engineering.

Industry panel members included James Hedgpeth Jr., Leo A Daly; Steve Moser, Goetting & Associates; Jennifer Volz, Wiss, Janney, Elstner Associates, Inc.; Roger Wozny, The Schemmer Associates; Guenther Dziuvenis, Johnson Controls; and Leigh Harrison, HGA.

Having industry so involved in the program and the community is a major benefit for students and faculty, said Clarence Waters, associate professor and director of UNL's Architectural Engineering program, who added that the program is providing "students who are second to none."

COOPERATIVE LEARNING INITIATED WITH WARSAW UNIVERSITY OF TECHNOLOGY



In June, the university hosted a delegation from Poland's Warsaw University of Technology and committed to further cooperation.

The agreement outlined student and faculty exchanges, long distance learning opportunities and joint educational and research projects. Above, WUT's Rector Włodzimierz Kurnik (lower left) and UNL Chancellor Harvey Perlman signed the document during discussions with WUT's Vice-Rector for Research Tadeusz Kulik and Nebraska Engineering Dean David Allen.

The ceremony was attended by Barbara Couture, senior vice chancellor of Academic Affairs; Prem Paul, vice chancellor for research; Peter Levitov, associate dean of international affairs; David Allen, dean of engineering; and Maria Kaszynska, a visiting scholar from Poland.

Rectors Kurnik and Kulik discussed specifics with Allen and chairs and faculty members from the mechanical engineering and engineering mechanics departments. The Polish leaders also greeted UNL doctoral students from Poland.

The UNL-WUT program in Lincoln is coordinated by Andrzej Nowak, professor of civil engineering. Warsaw University of Technology is the largest academic school of technology in Poland, with 2,000 professors and 31,000 students. WUT began in 1826 as the Warsaw Institute of Technology.

UNL EARNS \$8.1 MILLION NSF GRANT FOR NANOTECHNOLOGY RESEARCH CENTER

The university has received an \$8.1 million grant from the National Science Foundation to support the Materials Research Science and Engineering Center and its nanotechnology research through 2014.

UNL's center focuses on quantum and spin phenomena in nanomagnetic structures and is one of 26 such elite Materials Research Science and Engineering Centers in the nation. This grant continues support for the interdisciplinary research by UNL scientists and engineers associated with the center, which was established in 2002 with a \$5.4 million NSF grant.

"Grants for these centers are extremely competitive. Our continued success is indicative of the high quality of our faculty's research. They've put UNL on the map in the exciting field of nanomagnetics," said UNL chancellor Harvey Perlman.

Prem Paul, UNL vice chancellor for research and economic development, noted: "We expect UNL's growing nanotechnology expertise and the center's ongoing work with industry will lead to additional partnerships that benefit Nebraska's economy."

RESEARCH REACHES HIGH MARKS

Research expenditures for the College of Engineering are up 19 percent, announced Namas Chandra, associate dean for research at the college. The amount grew from \$19.5 million in 2006-07 to \$23.3 million in the recently completed 2007-08 fiscal year—part of a record-breaking year for UNL research overall.

The number of new awards for engineering research (not including continuations) increased by 38 percent, to \$21.4 million of the total funding of \$27.6 million for the 2008-09 fiscal year that began this summer.

"These achievements show that the faculty have done a tremendous job in the past year," he added. "Our Omaha departments have made especially remarkable gains."

The college's assistant professors, in particular, are doing extremely well with the number of proposals they are generating and the success of

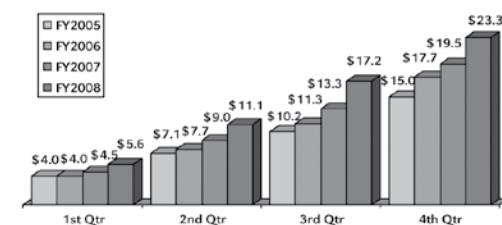
The center includes 20 UNL faculty from the departments of chemical and biomolecular engineering, electrical engineering, mechanical engineering, physics and astronomy, chemistry, and one physicist from the University of Nebraska at Omaha. Jeff Shield, professor and interim chair of the Department Mechanical Engineering, is involved via the Nebraska Center for Materials and Nanoscience. Shield said applications of this research include "magnetic data storage and energy technologies, among others ... things that may find their way into consumer products in five or 10 years."

"The grant also involves education and outreach programs, the most unique being one that brings in faculty paired with an undergraduate student from predominantly undergraduate institutions for a summer of research," Shield added.

"The groundwork for this grant ... is a culture of collaborative research within the materials community at UNL that was developed over many years, with the ultimate goal of being recognized as a world leader in magnetism research," Shield concluded. "We are excited to be recognized in this way and look forward to the research, education and outreach possibilities made possible by this grant."

those proposals among public and private funding sources, Chandra said.

He cited visits with funders, both at campus labs and at national funding agency locations such as the National Science Foundation in Washington, D.C., in establishing worthwhile connections. Chandra noted that many faculty also attended the National Science Foundation's regional conference, October 20-21 in Omaha.



SWANSON HELPS UNL COMPUTING CENTER SUPPORT LARGE HADRON COLLIDER



LiveScience has reported that UNL Computer Science and Engineering's David Swanson is a key figure in data handling arrangements supporting the Large Hadron Collider (LHC), an underground ring 27 kilometers around located at the European Centre for Nuclear Research (CERN) in Geneva, Switzerland. The LHC launched operations in mid-2008 but is currently on hiatus while adjustments are made.

Swanson teamed with particle physicists Ken Bloom and Aaron Dominguez, who had the idea to apply UNL's new research computing center for the benefit of scientists at UNL and across the country, with "the flood of information that will pour from the world's next-generation particle accelerator."

Detectors stationed around the LHC ring are projected to annually produce 15 trillion gigabytes



NEBRASKA ENGINEERING GAINS NSF FUNDING TO AUGMENT SCHOLARSHIPS

Nearly \$600,000 in grant funds from the National Science Foundation's Undergraduate Education Division will create 89 additional scholarships for underrepresented students during the next four years at the college.

The funding will establish a Students United in Classes, Community, Engineering, Service and Study Abroad (SUCCESS) program.

The SUCCESS Scholars Program offers competitive scholarships and academic/

of data that would be farmed out to computing centers worldwide. LiveScience noted "The Nebraska center will allow physicists from many universities to analyze data from the Compact Muon Solenoid experiment — a more than 12,000-ton detector that will record tracks created by hundreds of particles emerging from each collision in the accelerator — while also providing computing power for researchers in other scientific fields."

The LHC computing model has data from the experiments flowing through tiers. The Tier 0 center at CERN takes the data directly from the experiments, stores a copy and sends it to Tier 1 sites. CMS has seven Tier 1 sites in seven nations, and each site partitions its portion of the data based on the types of particles detected and sends these sub-samples off to Tier 2 sites. At the Tier 2 sites, researchers and students finally get their hands on the data. CMS has 30 such sites, seven in the U.S., including one at Nebraska. Physicists will use the data stored at these sites to search for never-before-seen particles or extra dimensions of space by submitting specialized programs to run on the data.

One of the challenges of building a Tier 2 site is preparing it for heavy data flow. According to LiveScience, the Nebraska group has already achieved the fastest transfer rates in the national network that connects Fermi National Accelerator Laboratory, the U.S. Tier 1 site, with the U.S. Tier 2 sites. Bloom estimated UNL "can manage a terabyte an hour easily, and a terabyte in half an hour is possible."

career-building support activities—including opportunities to study abroad and conduct undergraduate research—to academically talented, economically disadvantaged students from underrepresented populations, rural communities, and Nebraska's six community colleges who pursue an engineering degree at the college, according to Andre Fortune, Nebraska Engineering's director of recruiting and retention, who will help administer the program.

The college has made widespread gains in community-building programs through a



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As the CMS Tier 2 site at the university is part of the U.S. Open Science Grid, researchers from many fields will analyze data using its computing power during times when CMS researchers aren't keeping the site busy. UNL's data handling participation allows for parallel computations with "programs that perform multiple, simultaneous calculations on different processors and bring the results together at the end ... powerful tools for chemists and nanoscientists in particular."

new students' camp, residence hall learning community, freshman and sophomore seminars, peer mentoring, mid-semester checkpoints and study abroad programs. New advances will include the development of faculty mentoring, a SUCCESS study center, and emphasis on service opportunities with college and campus activities.

SUCCESS scholarships will go to 11 freshmen, 30 continuing students, 12 transfer students, 16 students pursuing study abroad, and 20 students seeking research fellowships.

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Zero Net Energy Test House unites university and industry as students' learning is caught green-handed

A WELCOME HOME

by JS Engebretson

A house of the future is rising in Omaha, thanks to the combined efforts of more than 100 architectural engineering and construction students and faculty in the College of Engineering and UNL architecture students.

When completed – hopefully by summer 2009 – this 2,000 square foot house, located in a quaint neighborhood adjacent to The Peter Kiewit Institute (PKI) and Scott Residence Hall, should actually provide more energy than it uses. Dubbed the ZNETH project, the zero net energy test home is a collaborative research effort by Nebraska Engineering, PKI, USGBC Flatwater Chapter, and the Green Omaha Coalition. Avery Schwer, associate professor of construction systems, leads the project.

This collaborative effort began on the drawing board. Approximately 90 students submitted architectural designs for the house, with the final plan donated by Tim Hemsath, assistant professor of architecture at UNL and chair of the Flatwater Chapter of the U.S. Green Building Council.

The ultimate goal of the project is to be “off the grid” in terms of energy usage.

“Creating a sustainable, long-lasting home with little impact on the environment is doable now,” Schwer said. In fact, he noted, our country already has the ability to build facilities that can produce more energy than they use.

Snuggled in with other small houses, this one-and-a-half story, Sears Craftsman-style bungalow will be covered in stucco, which is durable, reusable and features low volatile organic compounds – gases emitted from certain solids or liquids.

The estimated \$250,000 cost for a home this size is above average, said Schwer. While partly due to some of the environmentally friendly processes being used, the cost also factors in construction materials and recycling efforts. However, much of the excess cost will be recouped within about five years of energy savings, he added, and its resale value will be higher as well.

The project is not just about energy and environmental goals, Schwer pointed out, but about

investigating effective approaches to designing and constructing sustainable buildings for future residential and commercial performance.

“This is such a great opportunity for our students and faculty to learn while doing and to create an environment in which we can continue to discover new ways to create zero net energy buildings,” he said.

After the construction concludes, ZNETH will be used as a living-learning laboratory. Three UNL graduate students will occupy the four-bedroom house and continue to analyze its energy performance and determine ways to enhance it.

Student involvement is a key component of the project. Not only are the college’s students building the home, but they are serving in key administrative roles. Steve Cross, a senior in construction management, serves as the construction manager, and Thadaeus Bode, who is earning a master’s degree in construction, is investigating wind turbine and computer modeling applications.

“Our goal has been to capture our students’ imaginations to help engage them in the learning

Top left: students, faculty and professionals working on the ZNETH project include (left to right): Steve Cross, Jason Craig, Avery Schwer, RJ McClemons, Luke Carlson, Carlos Kilgore, Caleb White and Craig Colwell. Left, Garry Ruliffson (center) with OPPD speaks to the work group. Above: Avery Schwer and Carlos Kilgore review the plans.



 SOUTH ELEVATION
SCALE: 1/8"=1'-0"

ZNETH

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process,” Schwer said. “That’s certainly happened with this project, and we’re having fun as well.”

Freshman Carlos Kilgore, whose grandfather was one of the first black building contractors in Nebraska, is one of numerous first-year students learning hands-on about “green” construction.

“I’ve never done anything like this before,” he admitted, but added that eventually, he wants to own his own construction company and learning from the ground up is great experience.

According to Schwer, the house will earn the highest rating – platinum – from the Leadership in Energy and Environmental Design (LEED), which certifies nationally recognized standards for the design and construction of green buildings. It will be the first house in Nebraska to receive a platinum LEED rating.

The ZNETH home includes a number of innovative and environmentally friendly features, which also are being implemented to gain that platinum rating. For example, the garage is separate from the house, earning one point from LEED standards, and

geothermal pipes surround the house for thermal exchange applications.

Insulated concrete forms provide a “giant cooler effect” and an effective thermal barrier, said Schwer. Fox Blocks, whose vice president is a UNL engineering alumnus, provided the stackable forms, which create an igloo-like effect for the home’s exterior walls.

The footings for the house sit on tons of crushed rock that prevent radon and will be impenetrable to moisture.

A geothermal heat pump (to collect absorbed heat from underground) and solar cell panels are being installed as well. The planners have prepared for further energy storage by adding the most recent solar storage batteries, which can be somewhat pricey but also provide an active shelf life of at least five years. A “tankless water heater” will also be included, which heats the water when it’s needed but not continuously, like most water heaters.

As part of the overall process, the students and faculty working on the house have been actively

practicing materials reuse, as well as choosing construction materials that can someday be reused and recycled. A “retention pond” sits in front of the house in a puddle of dirt and excess concrete, stemming run-off and the loss of top soil. The leftover concrete will be buried on-site so as not to contribute to any landfills.

A plug-in for an electric car has already been placed in front of the house by the driveway and, according to Schwer, energy from the car’s large battery could power the house for a time in case of a major power outage.

The Omaha Public Power District (OPPD) has been very cooperative and helpful with the project, Schwer added. Garry Ruliffson, OPPD’s energy solutions specialist, serves as the “green rater,” providing advice and assistance throughout the process.

“By the time students graduate from our programs, they will have done considerable on-site work and have experience working in different roles. The benefits are immeasurable,” Schwer said.

Huskers at Honeybee,
a New York City
robotics firm, work on
Mars missions



NASA's Howard Cannon and Honeybee's
Gale Paulsen discuss preparations in their
work for the Mars Phoenix mission.

MAKING THEIR MARK ON MARS

by Carole Wilbeck

Above, from left, NASA's Brian Glass and
Howard Cannon meet with Honeybee's Erik
Mumm during testing in the Canadian High
Arctic. Below, from left, Gale Paulsen and Erik
Mumm work through engineering challenges;
the Icy Soil Acquisition Device includes a rasp
feature protruding from the ISAD's lower side.



Nebraska Engineers
helped build the
robotic rockhounds
allowing scientists to explore
possibilities for life on Mars.

Gale Paulsen, MECH '02, a native of Chappell, Neb., is a project engineer with Honeybee Robotics in New York City. He completed his master's degree in mechanical engineering at UNL in 2005 and started working at Honeybee that June, with a focus on drilling and acquiring samples during Mars missions. Honeybee's Spacecraft Mechanisms division was working on the Icy Soil Acquisition Device (ISAD) for the lander of the 2008 Phoenix mission. Near the end of 2006, the project partners (including NASA, Lockheed Martin, and the Jet Propulsion Laboratories) realized the gathering devices "weren't able to penetrate

the hard icy soil layer with the scoop alone," Paulsen said. After traversing millions of miles, the Phoenix lander's work would rely on a matter of millimeters.

"While Phoenix was in development, we added the rasp to the robotic arm design specifically to grind into very hard surface ice," said Barry Goldstein, Phoenix project manager at NASA's Jet Propulsion Laboratory in Pasadena, Calif. "This is the exactly the situation we find we are facing on Mars ... Honeybee Robotics in New York City did a heroic job of designing and delivering the rasp on a very short schedule."

"My focus was on developing the electrical ground support equipment for the rasp in the scoop," Paulsen said. His 14 months of work for this project involved collaborating on initial concepts and design, bread boarding (making small models) and testing the rasp. He also helped with life-testing of the engineering model and with the final assembly of the flight unit.

Building the motorized rasp for the robotic arm included designing controls for a mockup of the robotic arm. This unit was tested in a 3' x 3' chamber equipped to simulate the freezing temperatures and low pressure of the Mars environment. Paulsen was relieved that the ISAD worked well.

The experience tapped his Nebraska Engineering education, where Paulsen said he picked up "a lot of good skills in control design to apply directly to the system." His major influences included studying with Shane Farritor's robotics lab at UNL and working two summers at the Jet Propulsion Laboratories in Pasadena, Calif., with funding through Nebraska's Experimental Projects to Stimulate Competitive Research (EPSCoR).

For Paulsen, the summer 2007 launch of the Phoenix mission meant nearly a year of waiting to see how the landing, and then use of the robotic arm and rasp, would fare on Mars. The May 25, 2008 landing was successful, and NASA reported in July 2008 that the lander on Mars used its robotic

arm "to clear away loose soil from a subsurface layer of hard-frozen material" in a trench informally named "Snow White." The powered rasp generated ice shavings collected by the scoop on the back of the robotic arm, to deliver a sample of icy soil into one of the lander's laboratory ovens for testing.

On a future mission, the gathered grit could enter sample manipulation systems (SMS) worked on by Honeybee colleague, and fellow Nebraska Engineering alumnus, Erik Mumm.

Mumm earned his master's degree in mechanical engineering at UNL in 2002, and is a system engineer with Honeybee. He is working on the SMS for the fall 2009 launch of the Mars Science Lab Rover. In this work, Honeybee is a subcontractor to Goddard Space Flight Center, which is building Sample Analysis at Mars (SAM): a suite of instruments, including three spectrometers that scan samples to analyze whether life could exist, or has existed, on Mars.



Erik Mumm and Gale Paulsen, inset, work for Honeybee Robotics in New York City; they left Big Red but still focus on the red planet. Below, Gale Paulsen tests equipment in Rio Tinto, Spain.

"After Phoenix, we are next in the queue for Mars," Mumm said. "Currently we have delivered the flight unit, integrated for SAM testing. Next up this fall is a simulation test in a thermal and vacuum chamber that simulates temperature and pressure for the vacuum of space and on the surface of Mars."

"We will also place the instrument on a shaker table and simulate the launch environment to ensure the design and workmanship will endure the ride to Mars," Mumm said. "These units really get beat up while we're checking for unforeseen problems."

The Rover is designed to collect solid samples at the Mars surface and convey them to the SMS' 74 sample cups stored on a carousel. The samples then move to the pyrolysis oven with its airtight seal. The oven heats to 1100 degrees Celsius, Mumm said, which vaporizes the samples into gas that is plumbed to spectrometers and analyzed. A bake-out to 92 degrees Celsius for eight days allows non-metallic components to outgas in the vacuum.

"We want to be confident when we move the sample from inlet to pyrolysis that nothing else affects our sample measurements," Mumm said. "Preventing contamination is a big factor in our design, because you don't want to bring anything like that with you to Mars." The sample manipulation system must be extremely clean and sensitive, to measure on a scale of parts per billion.

It's challenging work, but Mumm enjoys it: "terrifyingly exciting - it gets in your blood." He always liked space exploration, but a turning point was seeing the Pathfinder Rover land on Mars: "I saw this shoebox size thing moving around on Mars, and I was hooked," Mumm said. Joining Farritor's mechatronics program at UNL opened more doors.

"Working with Shane led to my internship at JPL, where I got into Mars robotics," Mumm said. He learned of Honeybee and liked the idea of living in New York City (a big change from growing up in Kearney).

"Honeybee has 35 to 40 employees, mostly engineers, and it's a dynamic place to work; you get freedom and valuable experience," Mumm said. "I love the work - it ranges from environmental testing of flight hardware to proof-of-concept testing on low fidelity prototypes. There's a ton of analysis and building small prototypes, all with the overall focus on mitigating risks as early as possible in the program."

Farritor recalled Paulsen and Mumm in his program: "They were good students, hardworking and about as smart as you can get." It's no surprise to Farritor that these alumni are doing great things, but he said he misses playing basketball with them on campus.

Honeybee Robotics President Chris Chapman values the Nebraska connection in his company's operations. So far, it has meant "two highly dedicated and talented engineers who have proven to be solid self starters," said Chapman.

"In addition to being highly intelligent and creative in their approaches to engineering tasks, Erik and Gale have demonstrated some of the strongest work ethics that we've seen at Honeybee over the years and have led the charge on the various projects they've been involved with to date."

Chapman added, "If you have any more like them, please send them our way!"

For Nebraska Engineering students interested in advancing space exploration and their careers, this invitation might be just the ticket.



Joe Turner, professor and chair of the Department of Engineering Mechanics, collaborates with UNL plant scientist Sally McKenzie on nanoscale work with huge potential.

photo: UNL Office of Research

EPIGENETICS: A DIALOGUE BETWEEN BIOLOGISTS AND ENGINEERS

Engineers are working to develop nano-level tools that help promote RNA-encoding to advance genes' responses inside plant cell walls

by Gillian Klucas

At first glance inside Joseph Turner's laboratory, you'll spot students diligently examining plants and may think this is a biologist's domain. But the UNL engineering mechanics professor is part of a unique multidisciplinary project bringing together engineers, biologists and computer scientists to study how genes function and to develop a new generation of nanotechnology tools to help them.

Through the Nano-enhanced Epigenetics Research project, "we're trying to understand what makes a gene respond the way it does so that we might be able to someday duplicate or manipulate it," said plant scientist Sally Mackenzie, who heads UNL's Center for Plant Science Innovation.

Turner and Mackenzie are coordinating the project involving UNL, University of Nebraska Medical Center and Creighton University researchers. It's funded with a three-year, \$9 million grant from the National Science Foundation to Nebraska's Experimental Program to Stimulate Competitive Research (EPSCoR).

The biology team is exploring how plant genes react to stresses, such as drought, which may one day help plant scientists make agricultural plants more heat, cold or drought resistant. Other teams are examining how human genes respond to oxidative damage and comparing plant and animal cell responses to different environmental conditions.

"We're creating a new generation of scientists."

Turner hopes his work applying engineering concepts to plant cell walls leads to nano-tools that can introduce encoding material, such as RNA, into a specific gene or cell of a living organism, a more targeted approach than currently possible.

"We needed to start a dialogue between biologists and engineers" to achieve these goals, he said. "Until engineers understand the problems and needs of biologists, we won't know exactly which problems we need to address."

Researchers hope their unique partnership leads to a multidisciplinary center and further collaborations. Fred Choobineh, director of Nebraska EPSCoR, said this cutting-edge project builds on Nebraska's research strengths.

"Students also will benefit," Mackenzie said.

"They don't know what kinds of barriers have existed in past years between biology and engineering. They're more open to doing things in new ways. We're creating a new generation of scientists."

Energy Monitoring on the Home Front

Together with OPPD, Nebraska Engineering studies devices to promote efficiency

by JS Engebretson

Despite increased national attention on energy issues, people do not appear to be making significant strides toward conserving energy. A new initiative to be launched by the Omaha Public Power District (OPPD) and the University of Nebraska at Omaha (UNO) is attempting to change that. The Energy-Saving Potential (ESP) program was created to explore how the science and developed technology of residential and commercial energy conservation may be applied to achieve a substantial reduction in energy demand by individuals and small businesses.

One ESP funded project, "Energy Conservation and Behavior Change through Real-Time Energy Monitoring (RTM)" partners UNO and UNL's architectural engineering and construction programs. The RTM project seeks to determine to what extent displaying electricity use as it is being consumed (in both units of electricity and dollars and cents) influences sustainable behavior change regarding energy consumption and conservation, according to Patrick Wheeler, UNO's environmental advocate and principal investigator of the project.

According to Avery Schwer, associate professor of construction systems in Omaha, there is a great need to change consumers' energy consumption habits and behaviors, as well as to seek efficient energy delivery systems.

Dale Tiller, associate professor of architectural engineering, said the easiest way to monitor energy usage at the consumer level is via the monthly bill. However, he noted, "There isn't much timely information or specific details concerning the most costly times or what uses the most energy."

The study's objective, then, is to compare behavioral change and energy reduction as influenced by several commercial monitors to measure real-time consumption. Their hope: that more timely feedback on electricity usage will reduce

residential energy consumption, thus lowering energy bills.

Denise Kuehn, a 1987 electrical engineering graduate from UNL who is overseeing the study at OPPD, said the study "isn't about technical development of a new monitor, but behavior change for energy users."

For OPPD, which granted approximately \$230,000 to the project in its first year, "providing sustainable behavioral change without creating huge inconveniences for our customers" can not only save customers' money, but enable the company to reallocate its resources in other directions, said Kuehn.

The ESP project is also helping OPPD stay at the forefront of some "early trending" involving its customers in the energy consumption reduction process.

"Currently, there are a handful of companies in the U.S. and Canada working on projects similar to ours," she said, "but many are also in the early stages." She noted she had already spoken at several events concerning the university study.

As well as the team of faculty involved—including Moe Alahmad, assistant professor of architectural engineering; Dale Tiller, associate professor of architectural engineering; and two grad students—OPPD has provided staff support in the areas of rates, metering technology, call center training, and meter troubleshooting.

The Process

To begin the study, which kicked off in the spring of 2008, OPPD and the research team chose a geographic area in Omaha already being used for another pilot study. The fixed area network serving this area allows researchers to gather use information in 15-minute intervals, showing not only how much electricity was used, but when.

Approximately 2,000 invitations were sent to OPPD customers, with about 220 positive responses received. Ultimately, 150 households are currently involved in the project. Customers were assured that the study would not be used to raise electric bills and they would not be identified.

According to Alahmad, the research team evaluated seven monitors for such attributes as ease of set-up and operation, usefulness of data presented, aesthetics, accuracy of information, and the interface requirements. After careful review, two monitors – the Aztech In-Home Display and Blue Line Innovations Power Cost Monitor – were chosen.

The monitors were then divided into three groups of 50, with half of the Aztech in-home monitors programmed to display color changes according to times of day and half based on historical use of the home involved, Schwer said.

Approximately a dozen undergraduate and graduate students were hired to install the monitors from May to July, including at the homes of some research team members, OPPD staff and OPPD customers.

All of the monitors are fairly small and unobtrusive, Kuehn said, and are placed in the customers' kitchens or other high visibility areas for easy access.

"Each has its own strengths. There isn't really one that stands out as best, and they all have their own ideas and ways of monitoring information and usage," said Tiller.

"We understood the challenge: it takes a couple of months to really change behavior, but then, can that behavior be sustained?"

For the Aztech display, colors are used to show usage depending either on the time of day – green is off-peak, amber is mid-peak, and red is on-peak time (generally in the afternoon), or based on a percentage of historical summer use, where green represents the first 40%, amber from 40-60% and red anything above 60% (with the device resetting at midnight). The monitors show a numeric graphical display as well, including hourly usage in kilowatt hour (kWh) and dollars. Wireless technology is used to connect the monitors to smart electrical meters at the home sites.



Members of the energy monitor research team include: Josh Eiden, Denise Kuehn, Patrick Wheeler, Moe Alahmad, Avery Schwer, Steve Cross, Andrea Wilkerson

The Data

While the ESP project initially was scheduled to collect data through the summer of 2008, the project has been extended for an additional calendar year.

"We understood the challenge: it takes a couple of months to really change behavior, but then, can that behavior be sustained? Otherwise, it won't be worth the investment that the customers make," Kuehn said.

Analysis of the study will begin this fall, noted Schwer, with survey instruments developed for gathering customer feedback, and processing usage data gathered from Itron (the smart meter manufacturer).

Kuehn is currently using both monitors in her home and said participating in the study has helped her become even more aware of peak energy times.

"I'm finding that the visual signals are really important. For example, if the same colors regularly appear at the same times of day, then we tend to ignore data."

Kuehn's nine-year-old son is also very interested in the study and has been carefully involved in watching the energy monitors. It's not too early to begin educating the next generation of energy consumers, Kuehn said, and OPPD hopes at some point to extend this information into grade schools through an educational component.

Greg Bashford tests tendons with ultrasound. Photo courtesy of IANR.

Wave of the Future

Biological Systems Engineering professor Greg Bashford creates a new ultrasound process to detect the severity of tendon injury

by Lauren Hill '10, CoJMC

It is challenging to detect the severity of tendon damage, but professor Greg Bashford is researching a new way to improve the diagnosis of an individual with tendon damage.

Bashford's work in the Department of Biological Systems Engineering includes a study that ultrasounds may be a more accurate and inexpensive way to detect tendon damage.

Currently, hospitals use expensive magnetic resonance imaging machines to evaluate tendon injuries. In Bashford's study, ultrasound is used instead of the MRI. He has also created software that works with the ultrasound machine, showing a more accurate and detailed image of a tendon.

"I was familiar with creating software, but not for this type of machine," Bashford said. "It took me awhile to figure out how to coordinate an ultrasound machine to new software that would capture a picture of the tendon by bouncing sound off the body."

To test the new machine, Bashford and his colleagues assembled a sample of diverse individuals and examined their tendons, to show damage to the tendon of each person. The findings helped him analyze the machine and software to gauge his work.

Bashford said he hopes this new discovery will help make patients' recovery time shorter and more effective. With early detection, a doctor can diagnose a treatment that will improve patients' tendons before they become severely damaged.

Ultrasound images of a healthy tendon show a parallel collection of tissue. Images of a damaged tendon show a collection of thicker tissue that is disorganized.

Symptoms of an injured tendon include severe pain in joints, rapid or immediate bruising or swelling, weakness, the inability to bear weight or to bend the foot or walk normally.

Tendon injuries are most commonly the result of overuse, running on hard or bumpy surfaces, poor stretching habits, strong or weak calf muscles or flat feet.

Injured tendons frequently stem from activities with rapid movement, such as playing tennis, racquetball or basketball. These injuries can be more likely when an individual takes part in physical activity for the first time after an extended break.

Bashford said his process is more than 80 percent accurate and added that he hopes to improve it to the point where hospitals can use it. Madonna Rehabilitation Hospital approached Bashford about developing an ultrasound machine and software to diagnose the severity of tendon damage.

Bashford was assisted in this research by Nick Thomas, a 2007 biological systems engineering graduate. Thomas and Bashford also involved colleagues at the University of California.

The Layman Foundation covered the cost for this project with an initial grant of \$10,000. The foundation is a funding organization within the university that exclusively supports UNL research.

Study eyes predicting tenderness of steaks

by Dan Moser, IANR News Service

UNL scientists have developed a way to predict steak tenderness before the consumer takes that first bite. The technology could be a boon to the beef industry as it would allow retailers to charge a premium for a "guaranteed tender" label.

"Beef tenderness is a primary factor in consumer satisfaction," said Jeyamkondan Subbiah, assistant professor of biological systems engineering and the food engineer who heads the research. "However, a sufficiently accurate, nondestructive method of online evaluation of tenderness continues to elude the beef industry."

Current U.S. Department of Agriculture grading standards classify beef carcasses into quality and yield grades but do not assess tenderness. Since carcasses are not priced on tenderness, producers don't have a financial incentive to supply tender product.

The beef industry long has sought technology that could scan fresh meat at two to three days postmortem and predict its tenderness when cooked by the consumer about two weeks later.

UNL is developing that technology. Its approach uses a hyperspectral imaging, a novel technology that combines video image analysis and spectroscopy. The system consists of a digital video camera and spectrograph to capture the two key qualities that affect beef tenderness—muscle structure and biochemical properties.

In the research, two-day aged, one-inch thick ribeyes were placed on a plate and scanned by the system.

The combination of the video images and spectroscopy is key, Subbiah said. The video technology captures the muscle profile. Tender beef has fine muscle fibers, while tough beef has visibly coarser muscle fibers. The spectroscopy measures biochemical properties that indicate how much the steak will become tender during aging.

After scanning, the steaks were cooked and tested. Results so far are promising. The system predicted three tenderness categories - tender, intermediate and tough - with about 77 percent accuracy and two tenderness categories - acceptable and tough - with 93.7 percent accuracy.



BSE's Jeyamkondan Subbiah innovates a process with hyperspectral imaging toward a better beef guarantee.

Subbiah said a premium for guaranteed-tender product could be \$1 to \$2 per pound.

Researchers will continue to hone this process.

UNL, UC Irvine partnership engineers a talent pipeline

The College of Engineering has signed a course credit transfer agreement with the University of California Irvine Extension. Students who have completed the UC Irvine Extension Certificate programs in Embedded Systems Engineering, Communications Systems Engineering, or Medical Product Development can transfer credits for 15 or 16 quarter credits (equivalent to approximately 10 semester credit hours) into the Master of Engineering with a Concentration in Engineering Management (M.Eng.) degree program. A UNL graduate adviser will advise candidates on admission and program requirements.

Michael Riley, chair of the M.Eng. program, said, "UC Irvine has a good engineering reputation. The M.Eng. program welcomes students with backgrounds in the medical and biomedical products field. The agreement with UC Irvine should be a win-win situation for both campuses and the students we serve."

UNL's Department of Industrial & Management Systems Engineering administers the M.Eng. online program. Robert Williams, IMSE's interim associate chairperson, said, "About half of the IMSE faculty members teach in the M.Eng. program. The hard work and dedication of the faculty is now getting recognized and reaping some benefits. The agreement has the potential for increasing students admitted to the program and makes IMSE better situated to move forward with expanded online offerings."

After IMSE faculty agreed in principle to an agreement with UC Irvine, graduate chair Ram Bishu worked out the details with the IMSE Curriculum Committee.

The agreement was first discussed by Arnold Bateman, UNL associate vice chancellor, Extended Education & Outreach, and Rogelio C. Rodriguez, director of Engineering and Science Programs with UC Irvine Extension. While serving on a national committee together, they agreed a partnership between their institutions could be mutually beneficial.

Rodriguez praised collaboration with UNL as a "learning pathway" to lead UC Irvine Extension engineering certificate graduates toward masters' degrees."

UNL's non-thesis Master of Engineering Concentration in Engineering Management degree is a professional practice-oriented advanced degree program. The 36 credit

hour program is available completely online. The program is geared toward the working professional and allows students to develop a plan of study consisting of core courses and electives. The Department of Industrial & Management Systems Engineering also offers a 12 credit hour graduate certificate in Logistics, available online.

"Given the interest in developing the engineering workforce for the future, I anticipate this collaboration will be of interest, not only to individuals but also companies seeking to retain and grow talent within their respective organizations," he added, noting wider benefit. "Establishing learning pathways via collaborations with other institutions is key to developing our future U.S. engineering workforce."

"The agreement with UC Irvine should be a win-win situation for both campuses and the students they serve."

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Cargill plant goes ergo-friendly with help from Nebraska Engineering

by Carole Wilbeck

"We now know the triggers for injuries. Ergonomics can reduce them."



Raised platforms put workers at optimal heights for their task stations at Cargill's Nebraska City plant, as advised by UNL IMSE professor David Cochran.

For some, pain in the workplace stems from a colleague's bad jokes. Production line workers must more importantly avoid physical and environmental concerns that can harm livelihoods.

Employers are discovering occupational ergonomics:

"the design and operation of all equipment, facilities, processes and offices ... to minimize employee exposure to the risk factors associated with musculoskeletal disorders," according to David Cochran, Ph.D., professor of industrial and management systems engineering at UNL.

Leaders at Cargill's Nebraska City plant asked Cochran, with 36 years teaching or at the U.S. Occupational Health and Safety Administration, to assist in developing an ergonomics plan for this operation, part of the world's second largest privately-owned company, according to *Forbes* magazine.

From 2007 to 2008, Cochran studied Cargill's 500+ Nebraska City plant workers on the job, where the work includes cooking and packaging

beef and turkey items such as entrees for grocery stores and restaurants. He spent the most time focusing on workers dealing with high force and repetition, awkward or static postures, vibration, cold temperatures and fast pace.

Early on, he saw workers bending into waist-high floor bins to lift watermelon-sized pieces of beef or reaching across elevated, bed-sized trays with long sticks for scooping corners.

"We now know the triggers for injuries," Cochran said. "Ergonomics can reduce them."

Taking a step-by-step view of each task included observing degrees of movement, measuring work surface distances, and prioritizing adjustments that ease stress factors.

Cochran's work also assisted the plant ergonomics committee, comprised of line workers and management representatives. Committee members reviewed the job analyses, which were documented on paper and videotape, and helped assess challenges and decide solutions.

Instead of workers straining to lift heavy items from knee to shoulder level, mechanized bins can tip contents onto conveyor belts. Keeping work surfaces at waist level also makes sense.

Cochran's follow-up visit to the plant in September 2008 felt like the "reveal" on a televised make-over show. Prior ergonomics issues had declined, with changes earning an enthusiastic "Cool!" from the consultant. Night worker Sheldon Greenidge said he didn't miss the large-scale reaching and pulling work that felt "like digging through peanut butter."

"We're really encouraged with our progress," said committee member Chuck Jones, Cargill's environmental health and safety supervisor at the Nebraska City plant.

Bill Stieren, another EHS supervisor at the facility, noted that since the ergonomics plan was implemented, "zero incidents" have met criteria to be entered in the plant's OSHA log. (The number was never high, as some packing plants can be, but zero is the goal.) Even better, Stieren added, the culture is clear and expressed in "engaged employees (who) take care of each other" without hesitation to address problems and suggest remedies.

The cost to update work stations and add machines can initially appear high, but in the long run it pays to take care of employees, Cochran explained. Stieren agreed, adding that these investments help Cargill retain employees and be an "employer of choice."

Touch sensor research by **Ravi Saraf**, professor of chemical and biomolecular engineering, is featured in a new book, *Why the Lion Grew Its Mane, A miscellany of recent scientific discoveries from astronomy to zoology*, by *London Times* science reporter Lewis Smith.

Susan Hallbeck, professor of industrial and management systems engineering, was recently elected to the governing Executive Council of the Human Factors and Ergonomics Society.

Ron Yoder, department head of Biological Systems Engineering, is president-elect of the American Society of Agricultural and Biological Engineers. At ASABE’s annual meeting this year, Yoder received the PEI Professional Engineer of the Year Award, recognizing a licensed engineer who has made outstanding contributions to the engineering profession, the public welfare, and/or humankind. Additional honors for Nebraska Engineering from this ASABE event included:

- **Dean Eisenhower**, professor of Biological Systems Engineering, Award for the Advancement of Surface Irrigation. This annual award recognizes an individual, a group, or a project that successfully demonstrates and publicizes the effective use of surface irrigation.

- **Suat Irmak**, associate professor of Biological Systems Engineering, 2008 New Holland Young Researcher Award. This award is given annually in recognition of dedicated use of scientific methodology to seek out facts or principles significant to the agricultural engineering profession. It is endowed by New Holland North America Inc.

Michaela McBride, a senior majoring in Biological Systems Engineering, received a \$25,000 scholarship from Science, Mathematics And Research for Transformation (SMART). This program is managed by the Naval Postgraduate School on behalf of the Office of the Secretary of Defense. McBride was one of 200 recipients selected from more than 2,000 applicants. In the summer of 2009, she will intern in the Army Research Labs’ Department of Human Research and Engineering Directorate in Aberdeen, Md. She will then work in that lab for 18 months following her graduation.

UNL was well represented at the annual conference of the Architectural Engineering Institute of the American Society of Civil

Engineers in October in Denver. **Ece Erdogan**, assistant professor of architectural engineering, received awards for best paper: “Use of Ground Penetrating Radar for Accurate Concrete Thickness Measurements” by Erdogan, E, Morcou, G., Meyer, K. (AE student), Naughtin, M. (AE student), and for best journal: "Structural Appraisal of the Florentine Gothic Construction System" by Erdogan, Boothby, and Smith. Several AE undergraduate and graduate students also gave papers at the AEI conference, including:

- Experimental and Analytical Methods in Structural Design – *Ambient Environment Effects on Experimental Modal Analysis*: by Andrew Sorensen (AE Ph.D. student), Travis Schafer (AE senior), and Erdogan
- *Fiber Reinforced Mortar Mixtures for the Reconstruction and Rehabilitation of Existing Masonry Structures*: Catherine Armwood (AE Ph.D. student), Andrew Sorensen (AE Ph.D. student), Brian Skourup, B.S. AE ‘06 and MAE ‘07, Erdogan
- *Use of Ground Penetrating Radar for Accurate Concrete Thickness Measurements*: Erdogan, George Morcou, Kenzi Meyer (AE junior), and Mary Naughtin (AE grad student)

The Institute of Biological Engineering presented its Presidential Citation to **David Jones**, professor of Biological Systems Engineering, at its annual meeting in Chapel Hill, N.C.

James Goedert, chair of the construction systems department, is serving a second consecutive term as national chairman of Professional Engineers in Construction, an interest group of the National Society of Professional Engineers. Only one other person has served two terms as the PEC leader.

Steve Goddard has been named chair for the Department of Computer Science and Engineering. Goddard joined the department as an assistant professor in August 1998, and was promoted to associate professor in 2004 and professor in 2008.

Mahmoud "Moe" Alahmad, assistant professor of architectural engineering in The Charles W. Durham School of Architectural Engineering and Construction, is one of six Early Career Award winners announced July 25 by ELECTRI International. Alahmad will use the \$10,000 award to implement his proposal, “Integrating Industry

into the Educational Setting to Promote Learning.” He proposes conducting workshops where architectural engineering students who design electrical systems can connect with industry professionals who may implement those designs in future real-world construction projects.

John Thorp is now associate dean for the UNL College of Engineering’s Omaha programs. David Allen, dean of the college, made the announcement Oct. 1. Thorp replaces Ray Moore, who this summer was named the college’s associate dean for Undergraduate Academics on the Lincoln Campus.

Katelyn Bohling, a senior from Blair, Neb., majoring in Architectural Engineering, was awarded a 2008-09 Besal Lighting Education Fund Scholarship. Since 1983, the Robert J. Besal Fund has presented more than \$500,000 in merit-based scholarships to more than 200 students at accredited schools throughout the United States. Bohling joins a distinguished group of UNL’s Besal Scholars, including: Jeffrey Hargens, Brian Isley and Andrea Wilkerson in 2007-08; Sam Haberman, Chrysanthi Mishek and Andy Wilson in 2005-06; and Brent Protzman in 2003-04. UNL’s Architectural Engineering program, part of The Charles W. Durham School of Architectural Engineering and Construction, is one of only five schools that qualify for scholarships from the Besal Fund.

Also: Nebraska Engineering’s Quarter Scale Tractor Team placed sixth among 30 universities in a spring 2008 competition in Peoria, Ill. AGEN seniors and co-captains (left to right, below) Will Corman, Mark Tieszen and Grant Janousek led more than 20 students in the design and building of Big Red’s four-engine, four-wheel-drive tractor weighing 900 pounds without the operator (the engines were about 400 pounds). “This was an engineering challenge to design a tractor that used materials efficiently,” said Janousek, who plans to graduate in December 2008 with a B.S. in agricultural engineering, and then continue for his M.S. at UNL.



HOW NEBRASKA SHAPED US



Lewis Brannon Jr. is in the first row, far left in this 1944 *Cornhusker* photo of the Army Specialized Training Program’s 1st Platoon, A Company at Nebraska.

During the first week of October in 1943, we arrived at Love Library after leaving Fort Riley, Kan., in a horse trailer. Several thousand college students who had enlisted in the Army Reserve Corps some months before, had just completed 13 weeks of basic army training at Fort Riley and Fort Hood.

I had enlisted December 7, 1942 at Georgia Tech, where I was a sophomore chemical engineering student. At basic training we were given batteries of tests, and some of those who scored high were selected to attend the Army Specialized Training Program (ASTP) at the University of Nebraska. With several levels in several study areas, I was fortunate to be in the group of 60 for Advanced Mechanical Engineering. At the end of six months, our group was cut to 30—we remained, but the other ASTP groups became infantry replacements. Many of our best friends, good students all, went elsewhere; some died in Europe.

Although we came from engineering schools from across the country—from Georgia Tech, Washington State, Notre Dame, MIT, Cornell, LSU, Tulane, Oregon State, Yale, Texas A&M, Clemson, Illinois, Oklahoma and others—we became close friends. We lived in Love Library, studied, played and dated co-eds for a full year. Many of us are still in touch today.

We have many memories of our time in Bancroft Hall, with dedicated professors who taught and encouraged us, and became our friends. We remember Dr. DeBaufie, Jim Blackman, T.T. Aachus, P.K. Slaymaker, Marmo, Ludwigson, Sgt. Ducharme, and our PT instructor and local wrestler, Jerry Adams. We saw much more of them than just during classroom and

lab time in Bancroft. They would come to our study halls at night and even party with us on occasion.

Jim Blackman was my best man when I returned from Europe to marry my Chi Omega sweetheart, Rose Philips, in July 1945. She and I have been married for more than 62 years here in the Atlanta area. At least five of our group of 30 married NU girls.

Of the 30 great guys, 18 had sufficient transfer hours from previous colleges to receive their B.S. in Mechanical Engineering degree from NU, in absentia, in May 1945. This was 18 of 29 BSME

degrees and 50 total engineering degrees conferred in 1945. Six other group members accepted the engineering department’s invitation to return to NU after their discharge to finish their degree and master’s work.

We don’t hear much of these 30 in NU publications but, in my opinion, they were 30 of the greatest guys I have ever known. They were also very successful in their chosen fields: engineering, business, artists, doctors and more. I know 11 have died, and 19 I haven’t located, but the other seven still keep in touch.

Lewis Brannon, Jr.
Marietta, Ga.

In Memory

Omar Heins, EE '36, died Jan. 17, 2008 at the age of 96. He was born in Corder, Mo., and his life’s path led him throughout the world, including the University of Nebraska, where he earned a bachelor’s degree in electrical engineering. Following his mother’s death when he was 10 years old, Heins moved to Nebraska to live with an older sister who later convinced him to attend college. After graduating, he held jobs with the Power and Irrigation District in Hastings, Neb., and with the Tennessee Valley Authority in Knoxville, Tenn., building dams and power plants. Due to his ROTC training in Lincoln, in 1941 he was called to active duty with the U.S. Army, serving with several armored divisions (778th Tank Battalion, and the tank battalion with General George Patton’s Third Army) in France and Germany, and rising to the rank of major in 1945 when he was promoted by Patton. He was a lieutenant colonel when he retired from the Army Reserves in 1945. He worked with the Atomic Energy Commission at Sandia Base, later renamed Sandia National Laboratories, in New Mexico and was an electrical engineer with Sandia until his retirement in 1974. He was preceded in death by his first wife, Mildred (“Midge”), and his second wife, Mary. From his estate, a gift for the college will provide for a professorship as well as scholarships, fellowships or assistantships in electrical engineering.

FORE! A Good Cause

At the college’s annual Alumni Golf Tournament, Nebraska Engineers “researched” whether even a rainy day of golfing is really better than most other ways to spend a fall Monday.

In October, more than 60 alums and students showed up at Lincoln’s Firethorn Golf Club to help the Friends of the University of Nebraska College of Engineering raise funds for scholarships.

The event was organized by Gretchen Dolson, P.E., a project manager with HDR who is a 1996 graduate of Biological Systems Engineering and holds a 2002 MBA from UNL.



Nebraska Engineering thanks all our golfers. We hope to see you on the greens again next year, with a return to sunny skies!

1950s
Class of 1958 engineers celebrate 50th reunion



During Homecoming 2008, several of Nebraska Engineering's "golden" alums visited Othmer Hall. Clockwise from lower left are Bruce Lindley, Edward Travnicek, Gary Oakeson, Jerry Stratbucker and Ronald Lantz, who welcomed Dean David Allen (center) into their midst.

1960s
Bob Brichacek, B.S. EE '66, Columbus, is secretary/treasurer with Space Rentals, Inc. "I retired from Becton-Dickinson after 34 years.

1970s
PROFILE: John Miller -- A Success Story
by Lori McGinnis, The Leading Object (IANR)

Rabbits, guinea pigs, chinchillas, and other small pets are eating better thanks to John Miller, a 1971 UNL agricultural engineering graduate. Miller is founder and president of Oxbow Animal Health, maker of premium foods for small animals, in Murdock, Neb.

Similar to many other well-known inventors, Miller started Oxbow in his garage in Murdock, moved it to his parents' larger garage in Elmwood, then returned to Murdock, where the business is now centered on his farm. The renovated barn, built in 1901, houses offices for an approximately 50-person staff. The business has grown tremendously and now ships products throughout the United States and to 26 countries.

"We were really lucky to have the right idea at the right time," he said. "The market was ready for innovative products."

Having a successful business was far from his mind when he was a student at UNL. Miller was a member of Farmhouse Fraternity, and said the members had a reputation for being aggressive leaders. He added that his experiences gained from his fellowship in the Nebraska LEAD program also contributed greatly to his innovative ideas and leadership skills. After graduation, he worked as a petroleum engineer for Amoco then returned to his family farm several years later.

He decided against growing corn and soybeans since they were traded on the Chicago Board of Trade. Alfalfa was not a traded commodity; he could therefore have more control over the price.

I founded and sold business which made vending machines. I currently manage a real estate rental business, am writing a book, and am also engaged in farm management."

Donald J. West, B.S. CIVE '69, Southport, N.C., worked his entire career with the Federal Highway Administration (FHWA), serving in offices from coast to coast. He led the FHWA Division Offices in Vermont and Connecticut and also served in the FHWA Washington, D.C., Headquarters Office, working with Congress to craft transportation legislation. He retired in 2004 and enjoys building houses for Habitat for Humanity, golfing, boating, and entertaining six (soon to be seven) grandchildren.

1980s
Patrick Lee, B.S. AGEN '81, of Denver, was recently named president of Gates North America Fluid Power Division. He began with Gates as an applications engineer after graduating from UNL.

He held several positions in engineering, global business development, and most recently as vice president of North American Sales.

Joe Walter, B.S. EE '81, Houston, Texas, is product development manager for Subsea Systems with Schlumberger. He gained his MSEE in 1988 from Texas Tech University. "(I am) currently working as the product development manager for Deepwater Subsea Systems and Downhole Testing Products ... Schlumberger is a multi-national oil services company with 80,000+ employees working in 110 countries.

1990s
After 10 years in Washington, D.C., David Milligan, B.S. BSEN '96, and his wife moved back to Nebraska to raise their family. David is a patent attorney and a partner with Husch Blackwell Sanders LLP in Omaha. He is starting a patent law and intellectual property law practice in Omaha and Lincoln.



"I've always been really independent," he said. "That's one of the reasons I came to the farm and the reason I raised alfalfa instead of corn and soybeans."

He started Oxbow Hay Co. in 1980, learning to grow premium-quality alfalfa that he sold to dairies and horse owners. As he grew adept at marketing alfalfa, he decided to add value to his product. Realizing the types of available food for small animals was limited, "I started thinking about the pet food market," he said. "I knew I could do a better job."

He made his first bag of packaged alfalfa hay in 1993. Miller said the education he received in agricultural engineering was instrumental in his ability to visualize and create the custom hay stuffing machines that now package 2,000 tons of hay per year into 15-ounce and 40-ounce bags.

At the time, people were beginning to place a higher value on small animals as pets and were taking these pets to veterinarians. So in addition to trade shows and conferences, he also marketed his product to veterinarians who, in turn, promoted it around the world. Miller created a Web site in 1994, before most businesses had sites, and began to sell his product online.

Miller has added production and warehousing facilities to his operations and expanded the line of pet food. Oxbow now has 25 different products for a variety of carnivores and herbivores. It was the first company to package and market timothy grass hay, which is now a staple food for small animals. The company recently changed its name from Oxbow Pet Products to Oxbow Animal Health, a move, he said, that better defines the professional image and direction of the company's mission. In 2006 the Small Business Administration cited Oxbow as National Exporter of the Year.

Scott Sass, B.S. CM '98, Austin, Texas, is a senior project manager with DPR Construction, Inc., where he finished as project manager on Camino Medical Center (CMG) just over a year ago. CMG was a \$100 million project in Mountain View, Calif., for Sutter Health. The project involved Building Information Modeling (BIM) and LEAN Project Delivery Methods and has received awards from both AIA and FIATECH for innovation and delivery. After the completion of the CMG project, he relocated to the Austin office. He is currently working on a \$30 million project for Thomas Properties Group, a nationally recognized land/property developer. He has been with DPR for nine years. He and his wife, Beth, have two children: Owen (2) & Oliva (8 months).

Leigh (Ramert) Batten, B.S. ME '99, Fort Worth, Texas, is a senior aeronautical engineer with Lockheed Martin. "I work in systems design on the F-35 Lightning II (Joint Strike Fighter) program. I actively recruit for UNL at Dallas/Fort Worth area college fairs. I am also a board member of the Greater Fort Worth Metroplex USBC Association."

2000s
Blaine Christiansen, B.S. BSEN '01, holds a postdoctoral fellowship at Beth Israel Deaconess Medical Center in Boston (affiliated with Harvard University) and works in the Orthopedic Biomechanics Laboratory. He finished his Ph.D. in biomedical engineering at Washington University in St. Louis.

Shelby (Pridie) Fuerst, B.S. BSEN '01, is an industrial engineer (Package IE Planner) with UPS in Omaha. She received her M.S. in Industrial Engineering, also at UNL, in 2003. She has been a supervisor in the IE department for the past four years. She and her husband, Nathan, welcomed their first child, a daughter, in April 2007.

Matthew Jorgensen, B.S. BSEN '01, works with Abengoa Bioenergy in Colorado as a process engineer. He is part of the process design team for a one-of-a-kind starch/biomass hybrid bioethanol plant set to be constructed in Hugoton, Kan.

Michael Kimmel, B.S. BSEN '01, recently completed his Ph.D. in Biomedical Engineering at the University of Minnesota. He is a senior design engineer with Medtronic in the Cardiac Rhythm Disease Management group. Mike and his wife, Janis, have one child and live in Minneapolis.

Brian Magnusson, B.S. AGEN '01, received his P.E. license in 2006 and is finishing his MBA at Harvard Business School. After graduation, he will work for Bain & Company, a management strategy consulting firm, in their Chicago office.

Joshua Walles, B.S. CHME '02, of Spokane, Wash., is a plastic manufacturing engineer with KeyTronicEMS. "(I am) currently working on two new product introductions totaling over \$3M in injection molding tooling into the company's Juarez, Mexico plant."

Tim Bray, B.S. AGEN '03, is a design engineer with Airlite Plastics Company in Omaha.

Philip Christenson, M.S. '03, M.S. AGEN '04, has returned to Aurora, Neb., to begin farming after he worked for three years at John Deere IVS in Des Moines, Iowa.

Matt Foral, B.S. BSEN '03, is a process engineer in R&D with ConAgra Foods in Omaha. He enjoys the challenges and the exposure to a variety of processes. He and his wife, Anna, welcomed their first child, a daughter, in May.

Tony Paulsen, M.S. ME '03, works with Lockheed Martin on the Orion Crew Exploration Vehicle (CEV). The Orion program's mission includes safely transferring humans to and from the International Space Station (ISS), and providing a return to the Moon by the middle of the next decade.

Jennifer (Muller) Frey, B.S. BSEN '05, is a process engineer for ADM Corn Processing in Clinton, Iowa. She is currently the interim Alcohol Department superintendent.

Garrett Pommeranz, B.S. AGEN '05, is finishing his M.S. in Biosystems and Agricultural Engineering at the University of Minnesota.

Spencer Vorderstrasse, B.S. AGEN '05, is an irrigation design engineer for Reinke Manufacturing Co. Inc., in Deshler, Neb.

Melissa (Eman) Collins, B.S. BSEN '06, is a graduate research assistant in the Department of Biomedical Engineering at Texas A&M. She is working toward her Ph.D. in cardiovascular biomechanics. Her research involves

atherosclerosis and its effects on the abdominal aorta regarding the possibility of abdominal aortic aneurysms.

Mark Rentschler, B.S. ME '01, Ph.D. BMD '06, recently passed the Professional Engineer exam. He is an assistant professor of mechanical engineering at the University of Colorado in Boulder.

Scarlett Herrin, B.S. IE '06, M.S. IE '07, is a doctorate student in Industrial and Enterprise Systems Engineering at the University of Illinois at Urbana-Champaign, where she is conducting research in Human-Computer Interaction. Scarlett is involved in an interdisciplinary Ph.D. program between the IESE, Human Factors and Computer Science departments.

Max Porter, B.S. AGEN '07, is a design engineer with Behlen Manufacturing Co., in Columbus, Neb.

Aaron Stubbendieck, B.S. CHME '07, received the Automation Leadership Award in July 2008 from the Automation Division of Exxon-Mobil in Fairfax, Va., where he is an operator guidance technology engineer.



Bret Mader, B.S. CM '08, is a project engineer at BleekerVigesaa General Contractors in Brighton, Colo. Bleeker Vigesaa is owned by James Vigesaa, a 1988 graduate of the UNL Construction Management program. "We are very excited to add another UNL Construction Management graduate to our team," Vigesaa said. "Bret is working on our largest project to date, a 10-story high rise renovation located in Denver that will add upscale for-rent senior housing to the Capital Hill neighborhood."

PLAY-BY-PLAY WITH THE NEBRASKA ENGINEERING FLAG TEAM

by Carole Wilbeck

On Husker football game nights, the Sea of Red quickly fills Memorial Stadium. Yet one section of East Stadium seats stays conspicuously clear, except for eight students and a bulky roll of fabric. These young men and women are part of the College of Engineering Flag Team, and their moment is about to arrive.



Set in motion by Dean David Allen, after he saw rousing, oversize flags at Brazilian soccer games,

the 80' x 60' Power of Red flag appears at Husker Football home games with an official shout-out to Nebraska Engineering for operating this tradition that's right at home in Lincoln.

Sixteen engineering students comprise the overall flag team roster. On this night, William Stewart, a Lakeview, Texas freshman majoring in agricultural engineering, and Anthony Hanson, an Osceola, Neb., freshman majoring in mechanical engineering, are team leaders (a duty that rotates

for each home game). Their main task so far this week was making sure at least eight people, from 12 names on tonight's available flag team list, show up to "do the flag."

At 7:30 p.m. (mindful of the 8 p.m. kick-off) the flag team, clad in flag team t-shirts, gathers inside Gate 23. By 7:35 they check out the flag from a supply cage in a restricted area under East Stadium and spread themselves out along the length of the big, soft log and lift the flag to their shoulders. They snake through the crowds to their nearby section—the Red Sea parting just a little for this procession. At 7:40, with the band pooled along the field's sidelines, the flag team takes their stations at the opposite lower corners of the band's vacant seats. The adjacent sections are buzzing with socializing Husker fans, but the Nebraska engineers have a calm focus. They watch and listen for cues that trigger their fleeting but highly visible role in the evening's festivities.

At 7:45, as the band takes the field in formation, the rolled flag straddles the lowest row of the section it will soon span. Along the aisles at the right and left sides, flanking the 40 seats across, Stewart, Hanson and crew have their hands

They watch and listen for cues that trigger their fleeting but highly visible role in the pregame festivities.

poised on the top edge of the flag that will soon burst up into view.

The crowd noise rises at the announcer's words, "THE PRIDE OF ALL NEBRASKA," and Stewart signals the team to start running up the steps, keeping the flag's leading edge taut and elevated. The



The Nebraska Engineering Flag Team unfurls a tradition. Above are Evan Curtis (senior, BSE), Matt Norris (sophomore, MECH), Bill Poppe (freshman, MECH), Anthony Hanson, Kate Dewey (freshman, CIVE), and William Stewart.

stadium's giant replay screen captures an aerial image from a video camera perched on a high wire above as the huge flag unfurls.

In scattered spots where there's more flag than team, nearby fans reach in to give the flag a flap. For 85,000 fans present (and more watching via television), the flag impresses in its shining moment, an inspiration to see.

Still, as with many feats of engineering, the view from the inside (or underneath) is not quite as glorious. The flag's nylon, at a consistency like a thick plastic grocery bag, has a few holes despite the care applied during preparations; several flag repair sessions

are necessary each fall. And as the pregame proceedings shift attention to the National Anthem, the flag team hastily drifts the Power of Red flag's immense fabric back down to its baseline and gathers up the unwieldy mass to ferry it out and make way for the band's return to their seats. A quick re-orientation in the storage area enables the flag to be ready for its next use, with taped edges indicating "this end up."

It's literally a big deal, but no big deal to the Nebraska engineers who make the flag happen. They say they're just glad to be a part of it.



TYLER WORTMAN

by Carole Wilbeck

It's impressive that Tyler Wortman carries a 3.955 cumulative grade point average in mechanical engineering at UNL, but it's amazing that he does this while serving as a starting linebacker for the Husker football team.

In the Omaha World-Herald this summer, Mitch Sherman wrote that Wortman never received a grade worse than A-minus "until he got a B-plus in Engineering Measurements, a required course with a monstrous reputation among students in his major of mechanical engineering." Still, Wortman is well-positioned for his plans to graduate in May 2009 and attend graduate school, perhaps to study aerospace engineering or biomedical engineering.

The Daily Nebraskan quoted Wortman in a preseason media session: "You just have to work hard, be patient and good things will happen." True to those words, a few weeks later Wortman was honored with the Brook Berringer Scholarship during pre-game ceremonies before the San Jose State game. The scholarship, for a football student-athlete demonstrating community service along with "high ideals, excellent character and integrity" was endowed in the memory of former Nebraska quarterback Brook Berringer, who died in a plane crash on April 18, 1996. This past spring, Wortman was named to the Brook Berringer Citizenship Team for his outreach work: volunteering at Elliott Elementary School and participating in the Huskers' regular team hospital visits.



The 6'3", 253-pound senior has also been an eight-time Big 12 Commissioner's Honor Roll pick. He has long held an endurance approach to academics and athletics.

"I knew going into it that school and football were my priorities and that fun would have to come second," Wortman explained.

As defensive end and tight end in high school at Central Catholic in Grand Island, Wortman set a school record in career tackles for loss and earned all-state, all-conference and all-district honors. In wrestling, he medaled twice at the state meet and was a conference and district champion. He gained two gold medals at the state track meet, including participation in the 4x800 relay, and helped his team capture the Class C team title. He ranked first in his graduating class with a 4.0 grade point average and achieved academic all-state honors in all three sports.

At Nebraska, he worked his way up from a redshirt (walk-on) freshman to scout team player to backup linebacker during his junior year.

"Balancing mechanical engineering and being a student athlete at the same time is a tough job ... very time consuming, so managing my time was very crucial in my success," Wortman said. "It has been hard at times but in the end it is all paying off. I am very thankful to all of the advisers and professors who have helped me out along the way."

HEART OF A HUSKER MIND OF A MECHANICAL ENGINEER

Ride on

Big Red is going green these days, as UNL encourages energy-saving practices. David Sockrider, Nebraska Engineering's web developer, found an eco- and budget-friendly path on two wheels for his daily commute to work. So far, he has biked more than 200 two-way commutes, amounting to nearly 500 of his 1,500+ miles traveled in 2008.

Sockrider's 1.6-mile roundtrip ride to work can be more difficult amid rain or snowstorms, but he gears up and proves that living in Lincoln without a car is doable. A good tailwind and his favorite coffee ("Jamaica Me Crazy" blend) waiting at the office help motivate him on the darker mornings inbound. Traffic sometimes adds challenges, but he long ago developed the cyclist's ability to foresee and bypass what drivers can't.

Sockrider grew up on wheels, with a love of skateboarding, too. He knows Lincoln about as well as Google street views shows the city. And, with friends, he still gets out of town to Red Rocks (Colorado) or Wakarusa (Kansas) or Omaha for live music events.

"In 2008, I've spent less than \$200 on gas," Sockrider said. For the past six months, his riding stats tracked an average of 6.8 miles per day: comprised of his commute, plus occasional errands and riding for fun (Wilderness Park trails are some of his favorites).

"In January of 2009, it'll be a year that I've biked here every work day except two, when I bummed rides from (Chemical and Biomolecular Engineering staffer) Trish Fenster," said Sockrider. Cold weather is a disincentive—the chilliest riding temperature he has endured was -10F—but drivers using cell phones and not paying attention to the road create a more dangerous "anytime" hazard, he added.

So this winter as you're out driving and contemplating the cold, be kind to the bikers. Their tire tracks in the snow are not even as narrow as their carbon footprint.



Rules of the road: Nebraska Engineering web developer David Sockrider says his bike commute is less than 10 minutes each way, a ride that's faster by bike than by car.

photos by Katie McKinney '09



Somewhere, somehow an engineer had something to do with it.

Engineers touch every little thing we touch every day. Whether it's the car we drove to work, the roads we drove it on, the computer we use once we arrive, or the plastic bottle we drink water from once we're there, somewhere, somehow an engineer had something to do with it.

The University of Nebraska Foundation offers a number of funds to support engineering students, faculty, programs and research. If you would like, you can even establish your own endowed fund and name it for someone important to you.

No one needs to tell you how difficult the engineering program is or that engineering students can use all the help they can get.

For more information, contact Karen Moellering, Director of Development, at 800-432-3216. Or e-mail Karen at kmoellering@nufoundation.org. To give online, visit nufoundation.org/engineering.



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Engi-preneurs at work

Nebraska Engineering students role-play their way to success in a business simulation event

Not many people are cheering “market forces” these days. But in a computer lab beneath the UNL College of Engineering, high fives and knuckle bumps erupted on a November night during a business simulation competition for students.

JA Titan is a web-based game created by Junior Achievement to help students learn entrepreneurial skills. According to the JA Titan Web site, the experience features “changing economic conditions to gradually challenge” participants.

Fifty UNL engineering freshmen, sophomores, juniors and seniors showed up to participate in 21 teams of one to three students. Gathered around computer screens, the teams gained information to help them shape strategies for their manufacturing companies, including marketing and capital investments. The winner was the team with the highest company Performance Index, based on retained earnings, market share, productivity and growth. Prizes at Nebraska Engineering included \$100 per person for the top team and, of course, bragging rights.

“Most engineers use entrepreneurial skills as well as technical skills in their work environment,” said Norm Newhouse, vice president of technology with Lincoln Composites, and a Nebraska Engineering alumnus, who stopped by to offer real world perspective to students taking the JA Titan challenge. “Engineers are involved in product development to better meet customer needs, marketing their inventions to management and products to customers, and participating in decisions on capital expenses to improve production. JA Titan introduces these types of decisions.”

Dave Williams, the college’s assistant director of retention, wants to make JA Titan a Nebraska Engineering tradition. The idea came from mechanical



Engineering students Aaron Beauclair, Garrett Hummel and Sydney Schaaf plot their business moves during the JA Titan competition.

engineering alumnus Bob Brightfelt (B.S. 1965 and M.S. 1967), who tested the business simulation with students on the Engineering Learning Community’s annual trips he has sponsored. Brightfelt also supported the larger competition this year.

“Opening this experience up to the whole engineering student community extends the opportunity and the benefit,” Williams said. “We’d like to grow this event to include our engineering students in Omaha, and hopefully add competition with other programs at UNL.”