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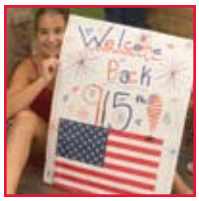

features

■ **Community Service**
Chemical Engineering's Kandra Hahn is passionate about serving her community—and Shakespeare. See page 30.

departments

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Fall 2005

Research improves education, develops tomorrow's leaders

Engineering is a complicated and challenging educational discipline. I've been at it more than 30 years, and I'm still learning new things every day. To encourage and stimulate my learning, I continue to be active in research. For most of us who do research, pushing our brain cells to the limit is not like work—it's really fun! I'll be honest with you: most of what I know, I didn't learn in undergraduate and graduate school; I learned it through research.

I am a firm believer that the intellectual abilities of faculty are significantly increased by the challenges of doing research, and these abilities translate directly into the classroom. In fact, there is a significant body of research in the United States indicating that faculty who do research make better teachers. Wouldn't you rather have your child learn from a professor who is a leader in the world in his or her discipline? The notion that "research" faculty are not interested in education is simply not supported by the evidence: most faculty, even those who do research, are genuinely interested in imparting the wisdom they have acquired to students, and those faculty who do research generally have more intellectual property to impart.

Photo by Tim Randall

Dean David Allen

In a recent newspaper article, I read that Nebraska has the slowest growing economy of any state in the country. This is simply unacceptable. We who live in this state cannot compete nationally, much less internationally, if we don't fuel the Nebraska business community with supercharged leaders. The single most important ingredient we in the academic community need to pass on to our students is intellectual property, because it is precisely this that fuels the economy. Research performed by our faculty is the means whereby we acquire that intellectual property that will be passed on to tomorrow's leaders.

—David H. Allen

Engineering Professor Retires After 50 Years

Don Nelson has accomplished a thing or two in his 50 years with the University of Nebraska–Lincoln. Known as the Father of Computing, he co-founded the Department of Computer Science (with Kenneth Smith), served as director of the UNL Computing Center for nine years, was a professor in two departments that are in two different colleges, and started i2rd, a local business that focuses on internet research and development (with Muh-Lin Chen, a former Ph.D. student of his who is now the principal owner).

A professor of electrical engineering and computer science, Nelson is retiring this year. "It's gone pretty fast," Nelson said. "When you retire you can get emotional—it's not something you really want to do, but your time has come. Now I have to look for something else to do, but it's been 100 percent UNL for a long time."

When he graduated from UNL, Nelson went to work at Bell Telephone Laboratories in New York. His work there was interrupted because of an ROTC commitment and the Korean War. After serving in the U.S. Air Force, where he was an instructor of special weapons, he returned to Bell Labs. He returned to UNL to work on his Master's Degree. In 1960, he went to Stanford University to set up his Ph.D., then returned to UNL to teach. In 1963, he became director of the Computing Center. "We had a good group of people there," he said. "We worked with the Jet Propulsion Lab, the U.S. Department of Agriculture and other organizations."

Nelson's area of expertise was simulation and use of computers to solve problems. One project on which Nelson and others in the Center worked, involved designing an online bill-drafting system for the Nebraska Legislature that allowed drafters to update legislative bills quickly and efficiently. They received a commendation for their efforts. Nelson believed strongly in building relationships with industry and worked hard to make that happen. It was especially rewarding, he said, because you could see the results immediately. "One company told me about a problem they were having and three days later I came up with a solution. The company had been trying to figure it out for three years."

Nelson's acumen doesn't surprise Khalid Sayood, a professor of electrical engineering. Several years ago the two worked on a project for the Army. "It was very instructive watching him work," Sayood said. "He's a very precise person. Everything has to be just so. That quality is very useful."

While Nelson has thrived on working with industry, what he really loves is teaching—especially at UNL. "Nebraska students are the best," Nelson said. "They are interested and work hard."

Students hold him in high esteem as well, said Jerry Hudgins, chair of the Department of Electrical Engineering. "He's had a strong, positive influence on the people around him—particularly his students," Hudgins said. "Many compliment him on the impact he's had on their lives."

Nelson didn't teach in the fall, but he might in the spring. See, he has a lot he'd like to pass on—things that aren't in the books anymore, but still might have value to students as they move from college into real-world careers. For now, he's "squaring away" his office, trying to get rid of things that have piled up over the years. He's not sure what he'll do, but one thing won't change: his "strong feeling" for the university. "I'm a Nebraskan. I enjoyed my undergrad career. Wherever I went, my knowledge kept me in good standing." He hopes the University will continue its path to greatness. "I want the citizens of Nebraska to have the best institution—that's what has driven me over the years."

—Constance Walter

Don Nelson in the NU Computing Services Network office.

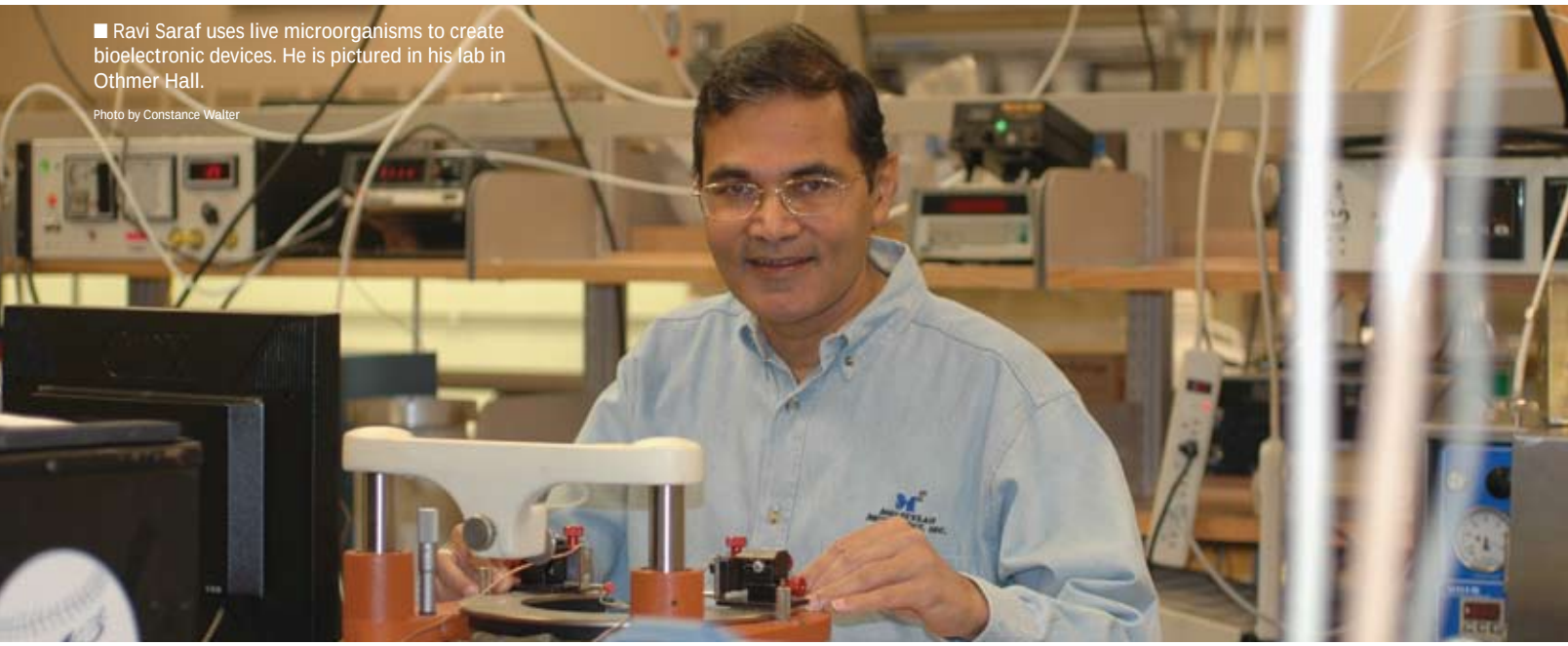
Photo by Troy Fedderson

Gilded Bacteria a Golden Discovery

Ravi Saraf has gilded living creatures, but that's as far as his resemblance goes with Auric Goldfinger, the fictional villain in the 1964 James Bond movie.

The University of Nebraska–Lincoln chemical engineer used bacteria, not another human, and his goal was to explore electrical devices that could lead to important technological advances, not to take over the world.

Working with Vikas Berry, a doctoral student in his laboratory, Saraf created what he believes is the first use of a microorganism to make a bioelectronic device with a live microorganism.



■ Ravi Saraf uses live microorganisms to create bioelectronic devices. He is pictured in his lab in Othmer Hall.

Photo by Constance Walter

Saraf and Berry deposited bacteria (Bacillus cereus) on a standard silicon chip inlaid with gold electrodes. After the bacteria formed bridges between the electrodes, Saraf and Berry deposited gold nanoparticles measuring about 30 nanometers (30 billionths of a meter) on the bacteria and introduced an electric current.

"On the bacteria's surface, there are these filaments that grab the nanoparticles," said Saraf, who came to UNL last year from Virginia Tech. "When the humidity increases, the bacteria swells because it absorbs moisture, and it contracts when the humidity goes down. When it swells or contracts, it increases or decreases the distance between the nanoparticles."

The distance between the particles, of course, affects their ability to exchange electrons and therefore their ability to pass on electrical current. Saraf and Berry found that a decrease of less than 0.2 nanometers between the gold nanoparticles (reflecting a decrease in humidity from 20 percent to essentially 0 percent), resulted in more than a 40-fold increase in electrical current.

"So now we have a very, very sensitive device that can measure humidity," Saraf said. "What is interesting is that the sensitivity of the device increases when the humidity goes down, which is completely opposite from other devices. Other devices work best when the humidity is high. They don't do well when the humidity is low. In the low-humidity range, our device is a factor of four to five times better than anything out there, in microelectronic devices."

The discovery was published by the highly respected German journal Angewandte Chemie International Edition. Funds from the Nebraska Tobacco Settlement Biomedical Research Development Fund helped supported the research effort.

Saraf said that if he lets his imagination go wild, he can envision this discovery leading to devices ideal for low-humidity, extraterrestrial environments in space and in high vacuums.

"That's great, but what really excites me is 'What's next?'" he said. "This work clearly shows that you can make nanodevices on live cells. Now, can we take the next step and have the live cell drive the nanodevice?"

Saraf said his idea is that microorganisms could be used to open and close electronic circuits, and maybe even power them.

"This is where I want to go and I actually have some reasons to believe it would work," he said. "If you can do that, now you can start thinking about a whole circuitry in which the microorganisms are driving the circuits and they're even powering it. You're powering it by giving microorganisms food. Instead of using batteries, which are caustic and environmentally unfriendly, you give it carbonaceous food, which is biodegradable. When you start thinking like that, you can add another level of logic that is based on nature's nanodevice, which is the microorganism. Nature is the best nanotechnologist. For example, the cell is a highly robust and sophisticated system of nanodevices. Therefore, combining it with physical nanodevice will add a high-level of functionality."

—Tom Simons, University Communications

UNL team wins $3 million to study thin diamond film technology

A University of Nebraska–Lincoln engineer is leading a team of engineers from UNL and the University of Missouri-Rolla on a project to refine a process that coats surfaces with thin diamond films. The team has received a three-year grant exceeding $3 million from the Department of Defense's Office of Naval Research. There is the possibility of an additional $2 million in out-years four and five.

The team is led by Yongfeng Lu, associate professor of electrical engineering. Other members of the team are Hai-Lung Tsai of mechanical and aerospace engineering at Missouri-Rolla and head project leader for UMR; Lan Jiang, mechanical engineer, UMR; Matthew O'Keefe, metallurgical engineer, UMR; Robert Schwartz, materials science engineer, UMR; and Xinwei Wang, mechanical engineer, UNL.

Photo by Tom Slocum

■ Yongfeng Lu

Photo by Tim Randall

■ The coating technique will use three laser systems: a resonance absorption laser, a UV laser and a controlled plasma cooling and coating formation laser.

The process under exploration by the team was developed in the mid-1990s by Michigan-based QCC Inc. That firm used overlapping pulsed lasers to deposit thin coatings of diamond and diamond-like carbon on surfaces. The underlying reasons for the process are unknown—the technology has preceded the science. That makes it hard to improve the process or extend it to other material systems. Lu's team will attempt to tease out the "how" of the technology.

"If we can understand the science of the phenomenon," Lu said, "and understand the principles behind it, we can use it for other materials besides diamonds."

The ability to coat surfaces—making them stronger, lighter and more resistant to corrosion or abrasion—has many applications. Military hardware is an obvious example, but the ability to coat surgical tools, auto bodies, airplanes or even golf clubs have been posited as potential uses. The diamond coating increases the hardness of the surface and protects it from humidity, abrasion, corrosion or other deformations.

The QQC firm used overlapping light pulses from three types of high-powered lasers—eximer, yttrium-aluminum-garnet or YAG, and carbon dioxide—to vaporize a thin layer when scanned across a material such as steel. This creates an electrically charged, superheated plasma of iron atoms that bonds to the surface as a new substance. But the fundamental science of how this works is still unknown.

The UNL-UMR coating technique will be "customized" to specific coating/substrate systems using three laser systems: a resonance absorption laser, a UV laser, and a controlled plasma cooling and coating formation laser. The team will work to establish the knowledge of the physics behind the process and develop a way to do this in "open atmosphere" rather than a vacuum, allowing coatings to be deposited on items like ships or airplanes. The team will test this system both theoretically, using computer models, and experimentally using the lasers.

The grant was one of 33 awarded through the Department of Defense's Multidisciplinary University Research Initiative Program (MURI). More than 120 proposals were submitted in the competitive grant process. Defense awarded $146 million over the five years to 27 universities. The MURI program is designed to address large multidisciplinary topic areas representing exceptional opportunities for future Department of Defense applications and technology options.

The awards provide long-term support for research, graduate students and laboratory instrumentation development. Three postdoctoral scientists will be supported at UNL and two at UMR; each institution also will support four graduate students. In addition, undergraduate students at UNL will work with Lu and Wang.

Lu said UMR's Tsai initiated the proposal effort and realized the joint collaboration would allow the two universities to be more competitive. Lu said two seed grants provided by the UNL Office of Research helped the team prepare its winning proposal.

Prem Paul, UNL's vice chancellor for research, said the proposal is an example of building competitive strength through multidisciplinary collaboration. He noted that only about a quarter of the submitted proposals won funding, and the institutions that received funding are among the nation's most prestigious.

—Kim Hachiya, University Communications

Liberty named Kettering president

Stanley R. Liberty, former dean of the College of Engineering, was named the new president of Kettering University in Flint, Mich. He became the university's sixth president when he succeeded Dr. James E.A. John on July 1.

Liberty joined Kettering from Bradley University in Peoria, Ill., where he was provost and vice president for academic affairs since January 1998. Before joining Bradley he served as dean of engineering for 13 years at the University of Nebraska–Lincoln and as that university's interim vice chancellor for academic affairs. He was the Nebraska representative on the Science and Technology Council of the States, a working group of the National Governor's Association, and advised Govs. Kay Orr and Ben Nelson on science and technology matters.

Peer Review of Teaching Project Wins National Recognition

In February, UNL's Peer Review of Teaching project received a TIAA-CREF Theodore M. Hesburgh Award Certificate of Excellence. Named in honor of Theodore M. Hesburgh, C.S.C., president emeritus of the University of Notre Dame, the award is given annually to the program judged to have best met the three award criteria: significance of the program to higher education, appropriate program rationale, and successful results and impact on undergraduate teaching and student learning.

Amy Goodburn, Paul Savory and Amy Burnett

Project co-directors Paul Savory, Amy Burnett and Amy Goodburn along with Dave Wilson received the award. Savory is an associate professor of industrial and management systems engineering; Goodburn is an associate professor of English and women's studies; Burnett is an associate professor of history; and Wilson is professor of teaching, learning and teacher education and a special assistant for faculty development in UNL's Office of Academic Affairs.

The UNL project is an intensive yearlong program in which faculty examine and reflect on how their teaching supports student learning. Through conversations, writing and analysis, participants document, test and assess their teaching using a model similar to that used when conducting scholarly research. The model validates the notion that teaching is an intellectually rigorous activity, Goodburn said. "It allows you to represent the intellectual work that goes into developing and teaching a course," she said.

Barbara Couture, senior vice chancellor for academic affairs, praised the work of the co-directors.

"This faculty-driven initiative emphasizes the intellectual and scholarly work of teaching, an effort that supports our faculty and helps ensure that our students have the best educational experience that we can deliver," she said. "We are proud of the excellent work done by Amy Burnett, Amy Goodburn, Paul Savory and the many other faculty members who have participated in this project for bringing this honor to UNL."

Nowak Joins Engineering

Dr. Andrzej S. Nowak, the Robert W. Brightfelt Professor of Engineering and Professor of Civil Engineering, joined UNL in January 2005 after 25 years at the University of Michigan where he was a professor of civil engineering. Earlier he worked at the University of Waterloo in Canada and State University of New York in Buffalo.

Dr. Andrzej S. Nowak

An expert in structural reliability and bridge engineering, Nowak's major research accomplishments include the development of reliability based calibration procedure to measure load and resistance factors. The procedure was successfully applied on calibration of AASHTO LRFD design code for bridges, ACI 318 Code for Concrete Buildings, the Canadian Highway Bridge Design Code, and British Standard BS-5400. He also has made important contributions to bridge diagnostics and evaluation, including analytical load models used for reduction of extreme load events for bridges and buildings and the development of efficient experimental procedures for weigh-in-motion measurement of truck loads, dynamic loads on bridges and fatigue load spectra. His proof load-test procedure, using military tanks, saved many bridges and millions of dollars.

Nowak received his M.S. and Ph.D. from Politechnika Warszawska (Warsaw University of Technology), in Warsaw, Poland. He has served as doctoral committee chair for 26 students, organized several major international conferences on reliability and bridge engineering, authored more than 300 technical publications, and chaired a number of committees associated with such professional organizations as ASCE, ACI, TRB and IABMAS. He is an Honorary Professor of the Warsaw University of Technology and Krakow University of Technology, and a Fellow of the American Society of Civil Engineers, American Concrete Institute, and the International Association for Bridge and Structural Engineering. Nowak received the ASCE Moisseiff Award, the IFIP WG 7.5 Award and the Polish-American Engineers Association Award.

Stetson Gives Back with Contribution to Construction Systems

The Department of Construction Systems recently was honored with a $1,000 general contribution to scholarships and department activities by Stetson Building Products, Inc. The company celebrated 50 years in business this year by giving each of its eight locations in Iowa, Nebraska and Illinois the opportunity to give back to their respective communities. Kevin Stetson, vice president, and Tom Broz, general manager in Omaha, selected construction systems because of the strong relationship the company has with the department, most notably with the annual golf outing.

Stetson Building Products Inc. of Omaha recognized the Department of Construction Systems at its annual Customer Appreciation Picnic on June 9. Pictured (from left): Christine Warren (secretary), Stuart Bernstein (assistant professor), Kevin Stetson (vice president, Stetson Building Products) and Keith Pedersen (assistant professor).

Alumni Association Recognizes Students

Two College of Engineering students recently received Leadership awards from the Nebraska Alumni Association. The Shane Osborn Award, named for the 1996 UNL graduate and Navy lieutenant, went to Jared D. Wall, '05, of Madison, S.D. Meghan M. Lyons, '05, an electrical engineering major from Brookings, S.D., is the recipient of the Vann Leadership Award, established by the late Howard Vann and his wife Judy.

Wall, an industrial engineering major and Air Force ROTC cadet, seeks out leadership opportunities and is ever-present during volunteer and booster activities. His leadership in preparing the ROTC sophomore class for field training resulted in four distinguished graduates and two superior performers. He has chosen the career path of military aviation.

Jared Wall

Meghan Lyons

Lyons was a senior in the J.D. Edwards Honors Program, where she worked for Stanley Senior Technologies and the Nebraska Department of Agriculture. She has served as president of the College of Engineering Student Advisory Board and vice president of Chi Omega sorority. She also is a member of Mortar Board senior honorary, served as a New Student Enrollment orientation leader and was a participant in LeaderShape Nebraska 2002.

ITLE Awards

Recently, several members of the college received recognition from the university through the Initiative for Teaching and Learning Excellence. In a speech, Chancellor Perlman said, "While research can be measured in dollars, ultimately our teaching success is measured by how well we help our students achieve their full potential...The tragedy of wasting even one mind should compel us to continue to devote our energies to achieve even higher levels of student learning and success."

The new Initiative on Teaching and Learning was funded by a grant of $427,000 from the University of Nebraska Foundation. Perlman said he intends to secure additional funding. The goal is to support projects related to selective implementation of the recommendations of the Transitions to the University Task Force report or for such other activities relating to undergraduate education.

"All of us at the university have an opportunity and a responsibility to help make sure students are better when they leave than when they enter. We hope to support these efforts wherever we find them," Perlman said.

Recipients of the ITLE awards are listed below. For the complete story, go to <http://www.unl.edu/scarlet/20050324special.html>.

National Internet Repository for Course Portfolios

Paul Savory, IMSE; Amy Goodburn, English; Amy Burnett, History: $24,820

The grant will expand the current effort to include creation of a national Internet repository or archive that will store and facilitate the distribution and external review of electronic faculty course portfolios. The project objective is to create a process for having course portfolios recognized as a high-quality, evidence-based measure of teaching effectiveness.

Team-Learning Assessment in a Multi-Disciplinary Project

Tim Wentz, Bruce Fischer, CM; Stuart Bernstein, CS: $4,505

The grant will be used to further integrate team-based learning with a service-learning component into an interdisciplinary course. Students will work on upgrading a former church into a space for The Meeting Place, a nonprofit organization that focuses on people with alcohol and drug addictions. The project is ideal because it offers a challenge for both architectural and construction management students to adapt the building for a new, multipurpose use.

Greening the Curriculum: Ecological Literacy in the Built Environment

Nathan Krug, Architecture; Duncan Case, Interior Design; Kevin Houser, AE; Bruce Fischer, CM; Kip Hulvershorn, Community and Regional Planning: $25,000

The grant will promote and provide the integration of principles of sustainability and "green building and development" in multiple disciplines. The grant also will set up a framework and expertise to provide university-wide, as well as continuing education, in the area of sustainability in relation to the built environment. The mission of the task force, composed of the co-authors listed above, will be to identify a set of shared courses from the five programs that would benefit from the integration of green building and development practices.

Development of an Interactive Classroom for Freshman CoET Students

James Goedert, CS: $35,000

The college won funding to convert the Construction Systems Computer-Aided Design/Engineering Graphics computer laboratory into an interactive teaching center primarily for freshmen and sophomores in the program. The funds will be applied toward phase two of this project. The converted classroom will have a permanent instructor station and interactive media. Equipment purchased will include a Smart Board, three projectors, three retractable projection screens and a control center built into a podium.

Student Kudos

Justice Appiah, a Ph.D. student in civil engineering and research assistant with the Mid-America Transportation Center, received the 2004 Council of University Transportation Centers' Charley V. Wootan Award for Outstanding Master's Thesis in Transportation Policy and Planning. His thesis, "An Examination of Factors Affecting High Occupancy/Toll Lane Demand," was sponsored by the Texas Transportation Institute and the Texas A&M University System. Appiah's research focuses on intelligent transportation systems and micro simulation modeling.

■ Justice Appiah

Linna Zhang, a master's student in civil engineering and a research assistant with MATC, was one of two national winners in the ITS America 2005 student essay competition, sponsored by PBS&J to encourage student interest and future participation in the development of intelligent transportation systems (ITS) and solutions. Zhang's essay explored various technologies in use for the enforcement process for traffic, parking and toll collection. Her research focuses on intelligent transportation systems and freeway vehicle detection sensor study.

■ Linna Zhang with Roger Svoboda from the Department of Roads.

Brent Protzman, a Ph.D. student in architectural engineering, received an NSF Graduate Research Fellowship that provides an annual stipend of $30,000 plus a $10,500 cost of education allowance. The award is renewable for up to three years. The research component of his proposal is titled "Transformation of Primaries and Color Matching Functions."

The University Nebraska–Lincoln RAB Student Branch recently received the 2004 Membership Growth Award from the IEEE Regional Activities Board for its outstanding leadership and results in membership development activities for the IEEE Nebraska Section, Region 4. Lance Perez, electrical engineering, is the student branch counselor.

The Department of Construction Management's student chapter of Mechanical Contractors Association of America (MCAA) received a $3,000 "Chapter of Excellence" grant, which it also received last year. Half of the grant is to be used for scholarships. The scholarships were awarded to **Brandon Limoges** and **Ben Johnson**, both officers of the chapter.

New Faculty

Computer Science and Engineering **Ying Lu** received her Ph.D. from the University of Virginia (2005). She obtained her bachelor's and master's degrees from Southwest Jiaotong University, China, and the University of Virginia (1996, 2001). Her research interests include autonomic computing, web architecture, distributed systems, real-time and embedded computing. She has also done significant work on feedback control of computing systems. At present, she has 10 publications in premier journals and conferences on real-time computing, quality of service, control, and distributed computing.

Architectural Enginering **Haorong Li**, received his Ph.D. in Mechanical Engineering in 2004 from Purdue University. He received his master's from Tsinghua University, China (2000), and his bachelor's from Nanchang University (1997). His primary research interests are in the modeling, analysis, control, and diagnostics of thermal systems that involve the design of physical and empirical models, automatic control algorithms, and automated fault detection and diagnosis systems for HVAC&R systems and thermal power plants.

Engineering Mechanics **Li Tan** received his Ph.D. from the University of Michigan, Ann Arbor (2002), and his master's and bachelor's from Tsinghua University, Beijing (1997, 1994). His research focus is in novel micro- and nanofabrication platforms and utilization in areas of nanoelectronics and biological and medical applications. He holds two patents: polymer inking as a micro- and nano-patterning technique, and imprinting polymer film on patterned substrate; and filed a provisional patent for successive shrinking of elastomers in May.

Biological Systems Engineering **Erkan Istanbulluoglu** research interests are in geomorphology, specifically modeling landscape evolution; coupling of erosion and vegetation dynamics; effects of vegetation and watershed disturbances on geomorphic processes; sediment transport; and natural hazard assessment. He received a Ph.D. in civil and environmental engineering from Utah State University, and holds master's and bachelor's degrees in agricultural engineering from Uludag University in Turkey. His appointment is split between Geosciences, 70 percent, and Biological Systems Engineering, 30 percent.

Mechanical Engineering **Carl Nelson** received his Ph.D. and master's from Purdue University (2005, 2002) and his bachelor's degree from the University of Oklahoma (2000). His research interests are robotics and mechanical systems design and analysis,

■ New faculty: Ying Lu, Haorong Li, Li Tan, Erkan Istanbulluoglu, Carl Nelson, Yong-Rak Kim

including specific thrusts in optimal design, design of modular mechanical systems, and incorporation of graph-theoretic techniques in mechanical systems design. He is specifically interested in adapting these concepts for surgical applications. He holds a joint appointment with UNL and the University of Nebraska Medical Center.

Civil Engineering Yong-Rak Kim's research interests are in geomechanics, characterization of highway materials, pavement engineering and constitutive modeling of civil materials and Structure. He holds a Ph.D. and M.D. from Texas A&M University (2003, 1999), and a bachelor's degree from Hanyang University in Seoul, Korea (1997). He has had numerous publications and recently received two grants from the Nebraska Department of Roads.

Electrical Engineering Mathias M. Schubert joined the Department of Electrical Engineering in November of 2005. An expert in ellipsometry, terahertz spectroscopy and optics, he received his Ph.D. from the University of Leipzig in 1997, where he worked in the Institute for Experimental Physics.

New Staff

Biological Systems Engineering Diann Young, receptionist; Monte Shomaker, secretary, environmental and bioprocessing bay

Chemical Engineering Kandra Hahn, administrative coordinator; Elizabeth Murach, administrative technician I

Computer Engineering and Electronics Robert Frankl and Kenneth D. Townsend Jr., electronics technician; Steven J. Eggerling, access grid/IT administrator

Dean's Office Marilena Carvalhos, international engineering programs coordinator; Gail Miller, administrative manager for Dr. David Allen; Michelle Sitorius, proposal writer, research; David Sockrider, Web developer; Lori Eagle Claw Straatman, student records and curriculum specialist; Ashley Washburn, communications specialist

Correction

Yuris Dzenis is the R. Vernon McBroom Professor. The title was incorrect in an article in the Spring 2005 *Engineering @ Nebraska*.

Kudos

■ Kevin Houser, architectural engineering, and Xin Guo (Ph.D. student, AE) received the 2005 Leon Gaster Award for their paper, "A Review of Colour Rendering Indices and their Application to Commercial Light Sources." The award is given once annually by the Chartered Institution of Building Services Engineers, for the best application paper published in the journal Lighting Research and Technology. ■ Lily Wang, architectural engineering, was selected the 2005 R. Bruce Lindsay Award recipient from the Acoustical Society of America. This prestigious award is given to a person under the age of 35 within the society. Wang received the award in May at the annual meeting in Vancouver, BC. More information about this award may be found at <http://asa.aip.org/awards.html#rbl> ■ Dean Sicking recently received the Texas Motorsports Hall of Fame 2004 Vision Award. The award was sponsored by REMAX and was given for Sicking's leadership, direction and supervision of the research project that lead to the development of the SAFER barrier. ■ Kevin Cole's Web site, Green's Functions Library passed a milestone: it is listed among the top five when searching Google for "green's functions" (a generic math term). In March his site received more than 500 hits from all over the world. Cole is an associate professor in mechanical engineering. ■ Bruce Fischer, construction management, and Stuart Bernstein, construction systems, received Associated Schools of Construction National Teaching Awards. The awards are given annually to faculty members of a four-year ASC member school and recognize contributions to construction education, excellence in teaching and dedication to the construction profession. ■ Eugene Wright, construction management, retired after 33 years of service and dedication to construction education at the university. ■ Tim Wentz, construction management, received a National Educator of the Year Award from the Mechanical Contractors Association of America. Wentz was nominated by a construction management student and was chosen by the MCAA's education committee. ■ William Velander, chair of chemical engineering, received the Resident Research Prize from the Society of Vascular Surgery for his paper, "Construction and Characterization of an FGF-1 Mutant-Collagen Binding Domain Chimera That Binds Collagen and Stimulates Endothelial Cell Proliferation and Chemotaxis." ■ Kevin Houser, Dale Tiller and Xin Hu, architectural engineering, received the 2005-06 Taylor Technical Talent Award from the Illuminating Engineering Society of North America (IESNA) for their paper, "Tuning the Fluorescent Spectrum for the Trichromatic Visual Response: A Pilot Study." The award recognizes outstanding papers published in LEUKOS, the Journal of the Illuminating Engineering Society. IESNA is the recognized technical authority on illumination and for more than 90 years has sought to communicate information on all aspects of good lighting practice to its members, the lighting community and consumers, through a variety of programs, publications and services. The award will be presented at the Centennial Conference of IESNA in New York in January. ■ Peter Revesz, computer science and engineering, received the prestigious "Humboldt Research Fellowship." He will visit the Max Planck Institute for Computer Science in Saarbrucken, Germany, which is among the top institutes for computer science research in Europe. The Alexander von Humboldt Foundation is a nonprofit foundation established by the Federal Republic of Germany for the promotion of international research cooperation. ■ Steve Reichenbach, computer engineering, was recognized as "Technology Professor of the Year" by the Applied Information Management (AIM) Institute. The award is presented to a postsecondary educator who has risen to the top of the profession to become an outstanding technology educator/administrator, a dynamic colleague and a caring mentor to students. ■ Bruce Dvorak, civil engineering, was appointed chair of the Small Systems Research Committee by the trustees of the Water Science & Research Division. His begins immediately and ends June 2008, at the conclusion of the AWWA annual conference.

Edgerton Explorit Center Turns 10

By Chris Bainbridge

Aurora was the Roman goddess of the dawn. What better town then, than Aurora, Neb., to host a facility dedicated to enlightening curious young minds? The Edgerton Explorit Center, named after Harold "Doc" Edgerton (BSEE 1925), opened its doors in 1995 and will turn 10 this fall. The center's namesake, a native of Aurora, is the father of the strobe light, high-speed photography, and side-scan sonar, which he used with long-time friend, Jacques Cousteau, to discover sunken ships and deep-sea creatures.

The Edgerton Explorit Center follows the distinguished MIT professor's philosophy of learning by doing, and describes itself as Nebraska's hands-on science center. Here students come to witness first hand such activities as shattering frozen tennis balls, using strobe light physics to watch a balloon pop, and stepping inside a bubble.

"We trick them into learning before they know what they're doing," said Michael Derr, executive director of EEC. "Whenever you see that light bulb turn on in a student's mind and actually see them learning, there are just no words to describe the satisfaction."

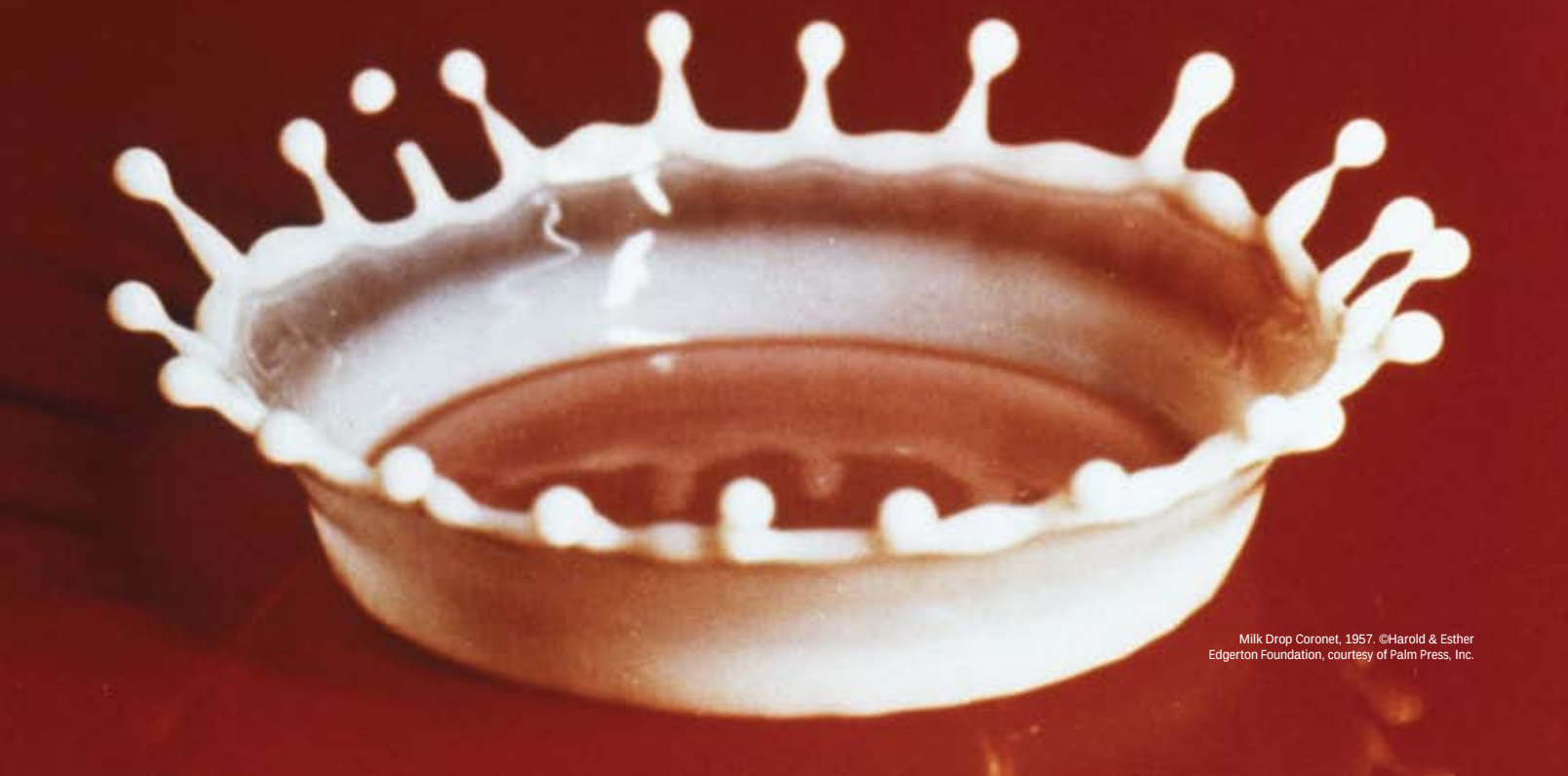
The EEC recently appeared in the Association of Science-Technology Center's bi-monthly journal, "Dimensions." They were also asked to give a presentation at the ASTC conference this September in Richmond, Va., with the Pacific Science Center of Seattle, and the Exploratorium of San Francisco. "It's a huge honor," Derr said.

While recognition flows in from across the country, it is the work the EEC performs right here in Nebraska that makes the biggest difference. In an age when schools are struggling to meet the new Nebraska state science standards, teachers turn to the EEC to help them introduce their students to science in fun, interesting and educational ways. In the words of one first grader, "this is better than recess!"

The EEC is a field trip destination for students and teachers from across the state. The future holds plans for greater outreach to schools too far from Aurora to make the drive. "We go to these farther away areas and basically create a fair-type atmosphere of scientific education," Derr said. While at the fair, students and their families encounter team-building and challenge-based problems that introduce them to new scientific ideas. Staff members of the EEC present demonstrations and supervise interactive experiments with students.

Derr said the EEC also is in the beginning stages of a capital campaign to obtain more funding for a scientist-in-residence program that has met with recent success. "What we do is bring in college professors from around the country doing research in various areas," Derr said. "Once they're here, they educate our staff and teach them about that research. The idea is to create new exhibits each year based on the most up-to-date science taking place in the country."

With new and exciting methods of education waiting in the wings, and with more and more students gaining that first look at the world of discovery, there is little doubt that after 10 years the sun is still rising at the Edgerton Explorit Center. A new dawn breaks each day for science in Aurora.



Milk Drop Coronet, 1957. ©Harold & Esther Edgerton Foundation, courtesy of Palm Press, Inc.

HELPING HANDS... AND WRISTS

By Kim Hachiya, University Communications

One of the problems with being an ergonomist is that one notices badly designed things and has an overwhelming urge to fix them. At least, that's how Susan Hallbeck feels. An associate professor of industrial engineering, Hallbeck is particularly interested in designing tools that perform tasks with the least amount of stress and trauma on the arms and hands of those using them.

A prototype surgical tool designed by Hallbeck and a team of undergraduate and graduate engineering students, in collaboration with physicians at the University of Nebraska Medical Center, promises to be better than current models. Called the IntuiTool™, it's an articulated grasping tool that can be used by surgeons performing minimally invasive surgeries. Often called laparoscopic or keyhole surgery, it is done through small incisions using specialized techniques and tools, miniature cameras with microscopes, tiny fiber-optic flashlights and high definition monitors.

Laparoscopic surgery, the fastest growing surgical technique, was developed about 1990, said Dmitry Oleynikov, assistant professor of surgery at UNMC. While this surgery has definite patient benefits—including faster recovery and less risk of infection—there are downsides for surgeons, including the tools they must use. "Current tools are essentially regular surgical tools on a long stick," Hallbeck said. The handles look like toy scissors and are "one size fits all." The tools also are commonly right-handed, forcing lefties to adapt.

Because the tools can grasp, but not rotate inside the body, surgeons manipulate the tools outside the body, often using both hands, forcing surgeons to hold the tools awkwardly and often causing stress and fatigue in the hands, arms and shoulders.

Hallbeck said many surgeons report numbness, tingling, pain and other problems when doing these surgeries. Over time, this repetitive stress could cause permanent damage. Because of pain or fatigue, surgeons might have to stop during a surgery to rest before resuming the task, lengthening the surgery. Training for the surgery is intensive, as surgeons must learn to work using long tools inside the body while watching a video monitor that shows the procedure in two dimensions. The breakthrough in the IntuiTool™ is in the articulation function—the grasper end rotates up to 120 degrees side to side using a roller ball the surgeon actuates using a thumb.

"Essentially, the IntuiTool™ gives you a wrist on the tool," Hallbeck said.

This is an unprecedented, even revolutionary breakthrough," Oleynikov said. "No one else has anything remotely similar. It absolutely excited the imagination of surgeons."

Susan Halbeck poses with the IntuiTool™ (on the left) and a standard laparoscopic tool.

The IntuiTool™, patented and trademarked by UNL, has been licensed to Gyrus Medical, based in Minneapolis, to develop, manufacture and market. It has yet to win approval by the Federal Drug Administration for use in humans, but Hallbeck is confident that will happen. The device won an honorable mention in the Third Annual User-Centered Product Design Award from the Human Factors and Ergonomics Society in 2004.

Among the questions Hallbeck and her team had to answer once they settled on the roller ball design was how the grasping-end of the tool should respond to the ball. Do users expect the grasper to go up when the ball is pushed up, or down?

"Good design should be user intuitive," Hallbeck said. "If I hand it to you, you ought to be able to figure it out intuitively."

Rather than looking to modify existing inadequate tools, they looked to start fresh. "We designed this thing from the ground up," Oleynikov said.

Hallbeck said that while an articulated tool was a high priority for surgeons, the "holy grail" for laparoscopy tools would allow the ability to distinguish tissue textures.

Oleynikov agreed. "The ultimate tool for surgeons is our hands. Laparoscopic surgery took our hands out of the mix. A surgeon really feels the most comfortable with his or her own hands doing the work on tissues. We are as close as we can get with current technology and a tool with tactile sensation would be extremely important."

The Greater GOOD

Nebraska Engineering students integrate experiential learning with community service

By Roxane Gay

Photo by Tim Randall

Educators have spent years trying to determine how students learn best. They've looked to interactive curricula, team-based learning, positive reinforcement and integrating new technologies into the classroom. Construction management professor Tim Wentz is taking these theories on learning, and heading in a different direction, by incorporating service learning into his curricula. He recently received an Initiative for Teaching and Learning Excellence grant from the University of Nebraska–Lincoln to incorporate service learning into the mechanical systems class, a unique course that focuses on mechanical systems and is cross-listed with architecture. "The course focuses on how a building behaves from both construction and architectural design perspectives," said Wentz, who is collaborating with Bruce Fischer in construction management and Stuart Bernstein in construction systems.

Throughout the semester, students will be divided into teams and told to prepare a response to a Request for Proposals. "I'm trying to determine the optimal configuration of teams," said Wentz. He'll be looking at how many students from construction management and how many architecture students should be in each team; the dynamics within each team; and ultimately, how to best incorporate service learning into a course. The project involves the Meeting Place, a former Baptist Church built in 1907 that now focuses on recovery programs. This summer, four students, two from architecture and two from construction management, began preliminary work on the project. "Four students are completely measuring The Meeting Place and creating a set of digital plans as the building is today," said Wentz. This fall students are creating a proposal on how to best heat and cool the building and providing floor plans that will best serve the client's needs. "The solutions the students come up with need to be 'green' and sustainable, both expectations that fit well with those of The Meeting Place."

The service learning approach offers the unique opportunity for real-world situations to shape the course's curriculum. Lectures and exams relate to the specific semester's project so that Wentz is best able to teach about specific conditions students encounter on construction projects. The grade is based largely on how students perform on the semester project, and each student submits a written report and a drawdel (half drawing, half model). They also assess each other's performance through peer assessment. In 2002, Wentz used service learning for a project at Christ Temple Church. "Students have been enthusiastic. The course material was originally perceived as boring by most students but now they take material and solve real-world problems," said Wentz. Students also have the opportunity to meet with clients and discuss the issue of meeting expectations versus exceeding expectations.

At the end of the course, Christ Temple Church had students give presentations to members of the congregation, and renovations are currently underway, based on many of the students' recommendations. "We also teach the students about how to ask questions to get the answers they truly need," said Wentz. Already, there have been positive results. "The students have outperformed everything we've put in front of them. They keep raising the bar." In the future, Wentz hopes that service learning becomes a more formal part of the curriculum.

Other community organizations have started to hear about Wentz incorporating service into his classes and he has been contacted by the Nebraska State Fair and the owner of the Parish Building. While Nebraska Engineering students will gain valuable experience by applying classroom knowledge to a real world problem, the greater benefit is in the service they are providing to a community organization. "Service learning is important because students can learn more and learn deeper," Wentz said. "And both students and the university have the opportunity to give back to the community."

Stuart Bernstein, assistant professor of contructions systems, also believes in service learning and is in the process of incorporating service learning into all of his courses. "Service learning allows you to tie community involvement with the students' education," Bernstein said. During the spring 2005 semester, he incorporated an interdisciplinary service project into his CET 4200 course that focuses on personnel and supervisory methods. "Students had the opportunity to work as project managers and direct more than 250 student volunteers, utilizing their construction background as a resource," said Bernstein. He worked with Family Housing Advisory Services of Omaha to find a suitable renovation project and decided upon the homes slated for the UNO Service Learning Academy's Seven Days of Service program. "The original intent was to find two houses, approximately 10 years old, that needed a new bathroom, kitchen, deck and paint job," Bernstein said. What they ended up with were two 90-year-old homes

Photo by Constance Walter

Photo by Tim Randall

ABOVE: Architecture students Stephanie Peterson and Michael Sinclair and construction management student Lea Thoene work on their service learning project.

LEFT: Tim Wentz, interim chair of construction management, with students at The Meeting Place.

OPPOSITE PAGE: Stuart Bernstein, assistant professor of construction systems, with student Scott Massengale in front of a renovated home in Omaha.

that were extensively distressed. Bernstein assessed the situation and resolved that he and his students would still be able to accomplish the home makeovers.

Bernstein is working with three University of Nebraska at Omaha professors and their students on the project. Communications professor David Ogden had students do public relations work for the project. The story was picked up by the Associated Press newswire and was featured in many local newspapers and television newscasts. Foreign languages professor Anna Carballal had students translate brochures for Family Housing Advisory Services from English to Spanish. Social work professor Paul Sather's students spent their time recruiting volunteers; raising awareness of the project; and collecting such donations as building materials, tools, food for the volunteers and door prizes for the reception. Bernstein's students had to commit to working at least two days during spring break and every class meeting was somehow connected to the overall project. At the beginning of the semester, Bernstein and his students walked through the two project homes then began to break the project into more manageable pieces.

By the time Spring Break arrived, the students were ready to manage and motivate their volunteers. "As the project evolved, we were able to see tangible results and my students reinforced their volunteers' attitudes with positive reinforcement. In the end, the volunteers took ownership of the project," said Bernstein. Once the project ended, students wrote papers discussing how the project went and their feelings on the work they accomplished.

Bernstein already is looking forward to new opportunities for the next project for the nonprofit organization City Sprouts, a home that will be converted into office space and a partial residence with ADA access. He also has been contacted by Fontenelle Forest, which heard about his other community service work through local media reports. They are interested in building a sky tower and possibly a sky walkway throughout the forest. "We will get involved, one way or another," Bernstein said. As he reflects on what his students accomplished in one semester and the impact their efforts had on the community, Bernstein is very proud. "I couldn't have asked for a better group of students," he said.

In both their personal and military lives, the Scherzberg brothers stay

Cool Under Fire

By Ashley Washburn

Photo © ROB & SAS

■ Front row: Matthew, Connie, and Justin. Back row: Brett, Marty, and Jeff.

Long after the childhood ritual of passing hand-me-down clothing from older siblings to younger ones has ended for the Scherzberg brothers, they swap textbooks, class notes, school supplies … and memories of war.

Jeff Scherzberg of Omaha and Brett, Matthew and Justin Scherzberg, of Papillion, are part of the second generation of Scherzbergs who have studied at the University of Nebraska–Lincoln's College of Engineering. The brothers, members of the Army Reserve, also fought in Iraq.

Their father, Marty, said his sons have always been close and pursued similar interests. They've also followed in the foosteps of other Scherzbergs.

Marty's father, Virgil, planted the seeds for his family's profession. A pilot for a construction company, Virgil wanted his children to attend college and believed studying civil engineering was beneficial for most engineering careers.

Marty and his oldest brother, Craig, took their father's advice and majored in civil engineering at UNL. After graduating in 1974, Marty built power plants across the United States for 15 years before returning to Nebraska. He is a maintenance supervisor for MidAmerican Energy in Council Bluffs, Iowa.

Marty's wife, Connie, remembers when she realized her sons would follow in their father's footsteps. "My van started on fire on the interstate," Connie said. "I was outside waving my hands and screaming for help, and Brandon and Jeff were yelling, 'Mom, get in here! We figured it out!' Here I was, scared to death, and my kids figured it out."

Photos by Jim Colburn

Brandon, 31, graduated from UNL in 1997 with a biology degree and plans to pursue environmental engineering. Jeff, 29, graduated from UNL in 2001 with a civil engineering degree and is a traffic engineer for Kirkham Michael in Omaha.

The youngest Scherzbergs said Jeff influenced their choice to study engineering.

Brett, 25, is a junior majoring in civil engineering and wants to work for the Army Corps of Engineers. Matthew, 23, is a sophomore in construction management in Lincoln, while his twin brother, Justin, is a sophomore in construction systems on the Omaha campus.

Jeff's wife, Kathi, graduated from biological systems engineering and is a pharmaceutical sales representative with Merck.

Connie jokes that the family should start a firm called Scherzberg & Scherzberg & Scherzberg & Scherzberg & Scherzberg. But military duties come before career aspirations.

The Scherzbergs joined the Army Reserves to earn money for college. A family history of military involvement also factored into their decision. Marty's father was in the Army Air Corps, and Connie's father, Robert Todd, served in the Navy during World War II. The brothers' uncle, Craig, is retired from the Air Force. Marty was disqualified because of medical issues.

When airplanes hit the World Trade Center Sept. 11, 2001, the twins watched in disbelief from a television at boot camp. "We knew then that we were in trouble," Matthew said.

On Feb. 23, 2003, Army officials told Brett and Justin they would be deployed. Matthew volunteered to go, and the trio left for training in Fort Carson, Colo., five days later. The Scherzbergs were stationed in Iraq for 10 months. As part of the 360th Transportation Company, they hauled fuel to military vehicles. The brothers traveled the southern two-thirds of Iraq, including Baghdad, Najaf, Basrah and Karbala.

After coming home, Brett, Matthew and Justin returned to UNL for the spring semester. While studying for finals, Justin received an unexpected phone call: He and his brothers would be deployed again. He immediately called Marty at work. Marty was nervous. Insurgency had increased, and Iraq was less peaceful than during the first deployment.

"It was not a good feeling at all," Marty said.

Connie said the family took the news hard.

"You think, 'Goodness, we survived. But no, we have to do it a second time,'" she said. "We were blessed once, but twice?"

Jeff decided to re-enlist. The first time his brothers were deployed, Jeff said, it happened too quickly for him to go with them. But this time, he had enough notice. "I felt that since they followed me into the Army, I owed it to them," Jeff said. "They were getting called up a second time, and I'd never been to Iraq."

Brothers Matthew, Brett, Jeff and Justin served together in Iraq.

Kathi said letting Jeff go was difficult.

"The morning he left, he had to be there (the airport) by 4 a.m.," Kathi said. "I woke up in the middle of the night and just stared at the alarm clock. I knew if I turned the alarm clock off, he couldn't go. But I told myself, 'It's in God's hands; it's not my choice.' So I didn't turn it off." This time, Jeff—the leader—followed his brothers.

The Scherzbergs left for Iraq in August 2004 and were stationed in Mosul. Unlike the first deployment, commanders gave the brothers different assignments whenever possible. Only Matthew and Justin belonged to the same platoon. Brett said being separated forced the brothers to find creative ways to communicate, such as leaving notes on each other's beds. When an assignment took Jeff to Matthew's base, he slept on the concrete floor beside Matthew's bed.

"You don't miss your family nearly as much when they're with you," Justin said.

However, togetherness sometimes caused fear. A roadside bomb once hit Jeff's truck, and another bomb hit a dining hall the brothers frequented.

At home, Marty and Connie relied on faith and the evening news to bolster their spirits.

Connie said she hasn't missed a church service since the first deployment. A resource teacher at Ralston Middle School, she assigned her students to write journals about the war. She also met with other soldiers' mothers weekly. Despite having four sons in Iraq, Connie said she never felt angry, "just proud and scared."

Marty watched the evening news after work, often falling asleep later in front of the TV. He looked forward to reading his sons' e-mails every Monday morning.

Kathi said news reports upset her, so she avoided them. Instead, she remodeled the kitchen and made a scrapbook from pictures Jeff sent from Iraq.

Marty and Connie heard rumors in March that a homecoming might be imminent. On May 25, Brett, Matthew and Justin arrived at the Kansas City airport. Jeff stayed in Iraq to complete another mission. His brothers offered to stay with him, but he begged them to go home, Connie said. When Jeff learned how dangerous his new assignment was, he was grateful his brothers listened.

Jeff arrived home Aug. 2, exactly one year after he left.

Slowly, life is returning to normal. The family went on a camping trip for the first time since 2002. Brett, Matthew and Justin are back at school. Marty and Connie even welcome the chaos of their sons spending time together, at home, safe and sound.

"It was a long year," she said.

■ Connie waits to see her sons during a welcome home parade in Council Bluffs, IA.

■ Jeff with father Marty.

■ Jeff and his mother-in-law Linda Chaillie.

The Future of Nebraska Engineering

Dean's strategic research plan addresses needs of government and students.

By Constance Walter, Ashley Washburn and Roxane Gay

The College of Engineering has a long history of innovation, invention and ingenuity.

Nebraska Engineers design robots for space exploration, surgery and traffic control; build smart buildings that lower energy costs and sophisticated infrastructures that carry travelers safely and efficiently to their destinations; find innovative ways to heal the human body and fight terrorism; help businesses implement radio frequency identification (RFID) into supply chains; develop tiny structures that will have a big impact on everyday life; and seek better, faster ways to communicate.

David Allen, dean of the college, realizes the impact such research has on everyday lives and with the input of several entities, put together a strategic plan that focuses on five research areas: Transportation and Infrastructure; Bio-medical Engineering and Engineered Bio-resources; Construction and Integrated Building Systems; Manufacturing Nanotechnology, Processes, Systems and Logistics; and Sensing and Communications. In determining the focus areas, Allen said he considered the needs of state and federal governments.

"This is an overlapping combination of what the state of Nebraska needs, what the federal government wants to invest in and where the College of Engineering has tremendous expertise," Allen said. "We can't be all things to all people, so we have to invest our limited resources in opportunities that will give us the greatest return for the state."

Nebraska Engineering professors work with several federal agencies including NASA, the Department of Defense, the Department of Energy and the military; local entities including the Nebraska Department of Roads, Omaha Public Power District and Nebraska Public Power District; national and international organizations including NASCAR; and numerous universities and governments around the world.

To reach the goals set in the strategic plan, Allen has made hiring experts in the five research areas a priority. "This will have a trickle-down effect for our students, who are our most important asset," he said. "These students in turn will eventually join the job force, hopefully in Nebraska, and provide intellectual property that will fuel the economy of this state."

Transportation and Infrastructure

Whether drivers travel the nation's highways or speed 200 mph around a NASCAR racetrack, they benefit from transportation research conducted at the University of Nebraska–Lincoln.

Christopher Tuan, associate professor of civil engineering at the Omaha campus, is developing conductive concrete that could make icy bridges less dangerous. The product is a mix of regular concrete and electrically conductive components, which allow the concrete to attain stable electrical conductivity. A thin layer of conductive concrete can generate enough heat to prevent ice from forming on a bridge deck when connected to a power source, Tuan said.

Maher Tadros, a professor in civil engineering, pioneered an ultra high-performance concrete that is comparable in strength to steel. The material can be used in bridges and buildings, as well as security facilities. "The toughness is created by using very tiny steel fibers—also used in steel-belted tires," Tadros said. "This makes it very difficult for bombs or shells to penetrate." Tadros also developed the NU I-Girder, a system that allows bridges to have longer spans and shallower structural depth, the inverted Tee bridge system for short-span bridges and NUDECK, a UNL-patented system for building bridge decks, which makes bridge construction faster and increases the bridge's lifespan. Most recently, Tadros has developed the NUTie. Made of fiber-reinforced plastic, the NUTie can be used in construction to create stronger and more energy-efficient walls.

Civil engineering professor Laurence Rilett is working with the Nebraska Department of Roads to develop a state-of-the-art microsimulation model for Nebraska's state highway system. The model is calibrated to current traffic and road conditions to assess traffic flow characteristics, driver behavior and traffic control operations. Rilett, director of the Mid-America Transportation System (MATC), is using a section of Interstate 80 between Lincoln and Omaha as a test area. In addition, Rilett and Dean Sicking, professor of civil engineering, are working to create the Nebraska Transportation Center, which would bring together all the transportation programs in the university system, including MATC, Midwest Roadside Safety Facility (MwRSF), and the National Bridge Research Organization (NaBRO), all civil engineering programs, the Nebraska Safety Center at the University of Nebraska at Kearney, and the School of Public Administration at the University of Nebraska at Omaha.

Rilett said he hopes the center becomes the premiere transportation systems engineering program in the Midwest, and one of the top programs in the country. "I believe our goal is very achievable," Rilett said. "We have a dedicated group of faculty and many research opportunities with both government and private agencies." And, he added, students will be the primary beneficiaries of the center's efforts.

"The big advantage in doing this is that we'll be able to raise the recognition level of transportation research at the University of Nebraska," Sicking said. "People recognize individual names, but don't always associate those names with the university. When we work together as a team and under the same flag, we become much stronger."

Sicking, director of the MwRSF, along with other UNL researchers, was instrumental in developing the award-winning SAFER (Steel and Foam Energy Reduction) Barrier, which is installed at racetracks throughout the country, including the Indianapolis Motor Speedway. The barrier absorbs energy to reduce the crash's impact, and then distributes energy over the wall without forcing the vehicle back into traffic. SAFER won Autosport's Pioneering and Innovation Award in 2004.

At the Peter Kiewit Institute, the Intelligent Transportation Systems, Information and Infrastructure Laboratory, which is part of MATC, houses a fully functional traffic management center to observe several intersections in the area so researchers can better understand traffic patterns and traffic management. Elizabeth Jones, associate professor of civil engineering, developed a traveling laboratory "that allows researchers to do detailed traffic studies in a wide variety of locations and collect detailed traffic data, then analyze it on the fly," Jones said.

Nebraska has been at the forefront of bridge technology and Atorod Azizinamini is one of the leaders. Azizinamini, the director of NaBRO, is committed to developing new technologies and one of the major research areas is developing high-performance steel (HPS), an advanced material developed by the Navy and the steel industry in 1995. The first HPS bridge, located in Sidney, opened to traffic in 1997; a similar bridge opened in Grand Island in 2003. "For such a small state to develop such a large number of innovative concepts and implement them in the field is simply amazing," he said.

For such a small state to develop such a large number of innovative concepts and implement them in the field is simply amazing.
—Atorod Azizinamini

Bio-medical Engineering and Engineered Bio-resources

Discovering innovative ways to heal the human body is a goal of several College of Engineering researchers.

William Velander, a chemical engineering professor, created the fibrinogen bandage, a potentially life-saving technology to be used on patients who lose large amounts of blood. When applied, the bandage immediately begins clotting the wound. Velander hopes the fibrinogen bandage will reduce the number of soldier casualties on the battlefield. "With combat wounds and other kinds of catastrophic injuries, the body can't mobilize enough natural plasma fibrinogen and other clotting system components to the wound site to stop bleeding," Velander said. Fibrinogen made from human plasma is scarce andexpensive, so Velander developed a process for producing it from transgenic pigs—pigs bred with a human gene that enables them to produce fibrinogen.

Soldiers also could benefit from Shane Farritor's groundbreaking surgical tool. Farritor, associate professor of mechanical engineering, along with University of Nebraska Medical Center researchers, is developing small surgical robots that could enable medics on the battlefield to gain better access to a wound. His team is working on two robots that could give surgeons better visibility of an injury and explore areas typically inaccessible to normal laparoscopic cameras; for example, the abdomen. "You don't know how slick, hilly and soft it is in there," Farritor said. "But we've developed a wheel design that allows for the necessary mobility."

> We're going to make life difficult for those trying to come up with new strains of biological agents.
> —Michael Meagher

Susan Hallbeck, in collaboration with physicians at the University of Nebraska Medical Center, has developed an ergonomic surgical tool. The IntuiTool™ is easier for surgeons to manipulate than traditional laparoscopic tools, minimizing the risk of infection and speeding recovery time for patients. "Current tools are essentially regular surgical tools on a long stick," said Hallbeck, an associate professor of industrial engineering. The breakthrough in the IntuiTool™ is in the articulation function—the grasper end rotates up to 120 degrees using a roller ball the surgeon actuates using a thumb. "Essentially, the IntuiTool™ gives you a wrist on the tool," Hallbeck said. The product received an honorable mention in the User-Centered Product Design Award from the Human Factors and Ergonomic Society in 2004.

Chemical engineering professor Michael Meagher is using the laboratory to fight the war on terror with a $6.5 million grant to create processes for the development of a botulism vaccine. Meagher's research is one project of the Biological Process Development Facility, which produces vaccines and therapeutics to treat people who have been exposed to biological warfare agents and viruses. "We're going to make life difficult for those trying to come up with new strains of biological agents," Meagher said.

Hendrik Viljoen, a chemical engineering professor, and George Gogos, a mechanical engineering professor, received a $1.44 million grant over five years from the National Institutes of Health to develop faster Polymerase Chain Reaction (PCR) technology. PCR is a technique for amplifying DNA to enable gene sequencing and identification. DNA amplification takes three or four hours with current technology, but a portable device created by Viljoen and Gogos allows amplification to take place in just 10 to 15 minutes. As PCR technology advances, scientists may someday be able to diagnose a viral strain or deadly pathogen on site. "This device makes our technology amenable to field usage," Viljoen said. "And it can handle volumes from 5 microliters to 40 microliters with outstanding sensitivity while producing a high yield."

Construction and Integrated Building Systems

Many of the national leaders in the construction industry have headquarters in Nebraska. Engineers at the University of Nebraska–Lincoln are striving to make buildings smarter, more efficient and more worker friendly.

Gregor Henze, associate professor of architectural engineering, is defining the concept of "smart buildings." To make commercial buildings more energy-efficient, Henze is using predictive optimal control, a technology to regulate the temperature inside a building. Henze hopes in the future, buildings will learn from their environments and make temperature control decisions based on that information. "We can be more intelligent about how we use energy while maintaining comfort and enhancing productivity," he says.

Kevin Houser, assistant professor of architectural engineering, and Clarence Waters, associate professor of architectural engineering, research the power of lighting. Houser's research seeks to fine-tune the radiant energy spectrum of light sources to get the strongest visual response with as low a light wattage as possible, while maintaining energy efficiency. "Lighting design is a balance between science and the more ethereal, artistic side," he said. "It also requires divergent thinking and treating each project as a unique entity." Waters studies lighting and power distribution systems for buildings.

> Lighting design is a balance between science and the more ethereal, artistic side.
> —Kevin Houser

Chuck Berryman, associate professor of construction management, focuses his research efforts on the utilization of fly ash in concrete pipes used for culverts, drainage and similar applications. His six design mixes were compared to current concrete designs and fared just as well in some cases, better in other. Yet, there are challenges. "As the technology evolves, the quality of fly ash is becoming very good," Berryman said. "And that technology offsets many of the variables faced when fly ash was first introduced to the concrete industry."

Lily Wang's research focuses on noise control and room acoustics, including modeling, auralization and concert hall design. "Much of what I'm looking at deals with human perception and how to quantify this in acoustics," she said. "When you go into a concert hall, there's this quality of spatial impression that makes you feel surrounded by music. But what gives you that impression?" With her Faculty Early Career Development grant from the National Science Foundation, the assistant professor of architectural engineering is working to answer that question, using a simulation process that examines the extent to which changes in the directional patterns of sound over time affect the distribution of acoustic energy in a room as well as human perception of the sound field.

While his colleagues focus on building materials and processes, Terry Stentz, associate professor of construction management, studies a human factor—the effect of sleep deprivation on railroad workers. His research examines occupational accidents, injury risk and fatigue as they relate to workers' job performance and safety. "We know train crews get fatigued—how can we minimize that fatigue, while maximizing performance and alertness?" Stentz said.

Timothy Wentz, associate professor of construction management, and Stuart Bernstein, assistant professor of construction systems, also bring the human touch to engineering. Both have incorporated Service Learning into their curricula as a way to tie community involvement with education. Bernstein's students did home makeovers on two 90-year old homes for Family Housing Advisory Services of Omaha. "Service learning is important because students can learn more and learn deeper," Wentz said. "And both students and the university have the opportunity to give back to the community."

Manufacturing Nanotechnology, Processes, Systems and Logistics

University of Nebraska–Lincoln researchers are developing new manufacturing processes that have the potential to transform business.

Erick Jones, assistant professor of industrial and management systems engineering, is finding the most efficient way for companies to track their merchandise. The Radio Frequency Identification (RFID) & Supply Chain Logistics Lab, which simulates a supply chain operation and mimics an actual warehouse, helps businesses implement radio frequency into their supply chains to track their goods from warehouse to shelf to consumer. "Industry wanted to see systems work beyond a computer model," Jones said. "This facility will make that possible." RFID has research partnerships with UPS, Square D, Speedway Motors, Lincoln Plating and Goodyear.

The Center for Nontraditional Research, directed by industrial and management systems engineering professor K.P. Rajurkar, is the only research facility in the United States dedicated solely to the examination of nontraditional manufacturing methods. The center's goal is to target existing and future needs for software and hardware. Researchers consider machinability, surface integrity, adaptive control, and expert systems in the processing of new high-tech manufacturing materials and methods.

Engineering mechanics professor Yuris Dzenis is developing a technology that is small in size, but could make a big impact. He is creating a method to produce advanced continuous nanofibers. His approach eliminates the problems of discontinuity and is safer and more economical. According to Dzenis, nanofibers can be used in biomedical applications, sensors, actuators and transducers, advanced composites, electronics, agricultural and environmental applications, energy conversion and space applications, among others.

> If we can understand the science of the phenomenon and understand the principles behind it, we can use it for other materials besides diamonds.
> — Yongfeng Lu

Nanotechnology researchers Xinwei Wang and Yongfeng Lu, both associate professors in mechanical engineering, received a $3 million grant from the U.S. Department of Defense's Office of Naval Research to refine a process that coats surfaces with thin diamond films. The underlying reasons for the process are unknown—the technology has preceded the science. That makes it hard to improve the process or extend it to other material systems. Lu's team will attempt to ascertain the "how" of the technology. "If we can understand the science of the phenomenon and understand the principles behind it, we can use it for other materials besides diamonds," Lu said.

Nebraska's Experimental Program to Stimulate Competitive Research (EPSCoR) program provided a $9 million grant to fund projects in nanomaterials science, mobile computing, cell biology and nutritional genomics. Fred Choobineh, professor of industrial and management systems engineering and director of EPSCoR, said the grant will be distributed among the organization's four major partners: UNL, University of Nebraska Medical Center, University of Nebraska at Omaha and Creighton University.

Sensing and Communications

People increasingly rely on technology to work, to play and to communicate. University of Nebraska–Lincoln researchers are keeping humans connected by conducting vital research in high-speed Internet protocols, computer security, wireless communications, satellite technology and telecommunications.

High-speed network architecture and wireless communications protocols are Hamid Sharif's specialties. The computer engineering professor is using the Internet2 platform to develop the next generation of Internet architecture for real-time applications such as streaming TV channels with broadcast quality and content-based indexing and video searching. Sharif says this technology will provide contents detection and indexing of media streams in real time. Sharif also is developing an energy-efficient communication protocol for wireless sensor networks. The technology is designed for mobile environments where energy conservation is key.

In applications ranging from robotic highway markers to helping farmers manage the impact of drought, computer scientist Steve Goddard is applying basic computer science research to real-world problems. One example of his work is energy-aware computing, which is aimed at saving as much energy as possible while still providing the bandwidth needed for processing or communications. This has important applications in embedded sensor systems, which are critical elements in many technologies, he said. "Embedded sensor systems run on batteries, and the system is only functional as long as the batteries are good," Goddard said. "Our work focuses on maximizing the life of the battery while still meeting all of the system needs."

New challenges come with new technology. Byrav Ramamurthy, computer science and engineering, is developing software tools for system administrators to use in preventing the abuse of wireless networks, which have introduced the concept of war driving. War driving is a phenomenon in which someone can gain access to deployed wireless networks by roaming around and scanning wireless channels to find vulnerable networks. "The more people convert to wireless networks, the bigger this problem will become," Ramamurthy said. "And the higher level of encryption you use, the more resistant your network will be to attacks."

Sebastian Elbaum, associate professor of computer science and engineering, is researching ways to make computer programs easier for typical users to manipulate and debug without special training. He is a member of the End Users Shaping Effective Software (EUSES) Consortium—a partnership among researchers at UNL, Oregon State, Carnegie Mellon, Drexel, Penn State and Cambridge. The consortium received a $2.65 million Information Technology Research award from the National Science Foundation to improve software for end users.

Wireless communications is Lance Pérez's area of specialty. The associate professor of electrical engineering is creating new wireless communications systems that can be used in rehabilitative and assistive technology applications. His goal is to create an inexpensive wireless sensor network that provides medical monitoring and environmental control in elderly or disabled people's homes. An intelligent sensor network that tracks their movements and behaviors could give voice prompts to help people navigate their homes or remind them to perform daily tasks. "The idea is that this technology will allow people to stay in their homes longer, live more safely, and improve their quality of life," Dr. Pérez says.

Dennis Alexander, Kingery Professor of Electrical Engineering, is helping scientists uncover the mysteries of outer space. Alexander is trying to catch a shooting star with aerogel, a lightweight silica material that is 99.8 percent air. NASA uses aerogel in space missions to collect interstellar and comet dust particles. "Scientists want to analyze these materials because it will give us a better understanding of the composition of comets," Alexander said.

> The idea is that this technology will allow people to stay in their homes longer, live more safely, and improve their quality of life.
> —Lance Perez

The Brilliance of Young Minds

By Chris Bainbridge

In an age when the responsibilities of our youth are in question and the legacy we will leave them is uncertain, the young minds of Nebraska engineers are working to make sure their future is bright and secure.

There are two avenues in place at the University of Nebraska–Lincoln that exist to give its young engineers a path to discovery and success. They are the College of Engineering's Senior Design Project, and the J.D. Edwards Honors Program's Design Studio.

Mark Tuch, a senior civil engineering major, desires a future in transportation and is well on his way. As part of his senior design project, Tuch and his classmates were given the daunting task of making Memorial Stadium safe for the 21st century. With the threat of terrorism mounting, and displays of violent bombings making headlines daily, security personnel in Lincoln and at UNL are all too aware of the sea of red's vulnerability.

Fred Gardy, assistant chief of police at UNL, contacted the Department of Civil Engineering to help solve this security dilemma. Memorial Stadium is one of the most exposed venues of its size in the country, and many feel that changes need to be made. The prospective security improvements include defending against bombs, improving the building's perimeter and screening, creating an emergency evacuation plan, and improving gate procedures. Gardy came to Tuch's class with a couple of requests: devise a plan to create a 300-foot perimeter to move all vehicles from the stadium, and to decrease injuries that could result from a mass panic as people flee the stands.

"Basically, this is a project the university is looking into funding, and Fred [Gardy] is going to use our information to show the need for the support of this project," Tuch said.

Tuch's class faced tough challenges in drafting its proposal. There are several key streets and parking lots currently inside the proposed 300-foot perimeter. Traffic would need to be rerouted, and the developing Antelope Valley project and new practice facility have left roads surrounding the stadium in a state of limbo. Ultimately, the university does not want to lessen the fan experience.

Working within and around these limitations, Tuch's project relies heavily on information provided by state agencies regarding explosives and blast radii. Their developing proposals involve the most recent technological advances in barriers and barricades, as well as traffic planning.

As Tuch and his classmates progress, their findings continue to break new ground. "Not a lot of firms do this sort of research," Tuch said. "We're having to pull bits and pieces of information from different places." Tuch's hard work creating this proposal is paying off in more ways than one. "It's an opportunity to get more experience and continue to work on teamwork. But, ultimately, we're making everybody safer, and you can't really put a price on safety."

Safety was also a theme in another project in the J.D. Edwards Honors Program. Sunita Gupta, a senior computer engineering major, worked with five other students on a project for a local Lincoln medical technologies firm. Clients who work with the J.D. Honors Program pay the program and in return students gain real-world experience in the fields of computer engineering and business.

"This is not a cookie cutter project," Gupta said. Most projects undertaken by design studios within the program tend to be a Web interface to some sort of database system. This client is not expecting a product at the end; rather, Gupta's team was charged with coming up with an evolving prototype of a wireless asset tracking system to track people and things within buildings.

"Most people just think, 'oh, you can use GPS for that,'" Gupta said. "But what they don't realize is that the satellite has to be able to see you, and satellites can't see inside buildings." Similar systems do exist today, and run at about 2.4 GHz. But Gupta's team looked at developing a new technology. "There are two different devices that could be used. One you push a button to send a signal, and the other constantly transmits." Possible uses for this technology are to track hospital patients, prison inmates, retail merchandise and sensitive materials in office buildings.

"I want to go into hardware development and this is the exact process you go through, so this project is just perfect for me," Gupta said. "It's cool to see how you can research something and develop it into a viable system."

Tuch and Gupta presented their final plans to their clients at the end of the school year. Now, new challenges with new technologies await them. Their recent struggles and successes can only serve to bolster their confidence and our state of security. It appears that perhaps we need not worry so much about what will become of our younger generations. Their futures are in good hands—their own.

Class Notes

■ Steven Barrett, EE '79, is a faculty member in the Department of Electrical and Computer Engineering at the University of Wyoming. Barrett was named Carnegie Foundation for the Advancement of Teaching Wyoming Professor of the Year 2004, and was promoted to Associate Professor of Electrical and Computer Engineering with tenure in July 2005.

■ Associate Dean John Ballard tees off at the alumni golf outing in October.

Photo by Tom Slocum

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Send a note with your name, department, graduation year, and what's new!

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Upcoming College Events

Jan 26	Discover Engineering Day for 5th and 6th graders, UNL
Feb 2	Insights into Internships, UNL
Feb 9	Discover Engineering Day for 7th & 8th graders, UNL
Feb 13	Networking Workshop: "It's what you know and who you know," UNL
Feb 20	Red Letter Day, UNL
Feb 20	Maverick Monday, PKI tours
Feb 20-25	PKI IS&T & E-Week, Omaha Campus
Feb 21-22	Spring Career Fair
Feb 25	PKI Spring Open House, Omaha Campus
Feb 25	Explorer's Program, Omaha Campus
Feb 26	Big Red Road Show, Qwest Center, Omaha
Mar 1	TEAMS Competition, UNL
Mar 11	Girl Scout Program "Introduce a Girl to Engineering," Omaha Campus
Mar 29	Summer Job Fair, UNL
TBA	OPS Early Awareness Program, Omaha Campus
Apr 3	Maverick Monday, PKI tours
Apr 17-21	E-Week 2006, UNL
Apr 20	Downtown Technology Expo, UNL
Apr 21	E-Week Open House
Apr 21	Nebraska Engineering Admitted Student Recognition Reception, UNL
Apr 27	Faculty & Staff Recognition Reception
Apr 28	Lincoln Student Recognition Reception, UNL
Apr 28	Omaha Student Senior Design Showcase, Omaha Campus
Apr 29	Omaha Student Recognition Reception, Omaha Campus
TBA	OPS Early Awareness Program, Omaha Campus

SUMMER 2006 (June, July, August)

Academy of Excellence, Omaha Campus

Bright Lights Engineering Odyssey Camp, UNL

Honors Colloquium, UNL

For information about college events, contact Ann Koopmann at (402) 472-7094 or e-mail akoopmann1@unl.edu.

Simply Service

Chemical Engineering's newest staff member is committed to her community

Photos by Tom Slocum

Kandra Hahn has long believed in serving her community. "I believe in what people do as a group," she said. "Life is better when we're thinking about what we can all do together, as a community." Her life reflects a diverse range of experiences and her commitment to service. She has been elected to public office twice—as Clerk of the District Court and as the Lancaster County Clerk and she was appointed director of the Nebraska Energy Office when Bob Kerrey was governor. Hahn also served as the assistant director for business affairs of the University of Nebraska Press and is the administrative coordinator for the Department of Chemical Engineering.

As passionate as Hahn is about serving her community, she is equally passionate about Shakespeare, whose work she has enjoyed since reading "Julius Caesar" in the 7th grade. She has been able to combine service and Shakespeare through the Flatwater Shakespeare Company, which was co-founded by Bob Hall, a longtime member of the Lincoln theater community. Hahn met Hall at a party and thought he was phenomenal. "I knew then I wanted to work with him and do whatever I could to support his efforts." Since then, she has taken on many roles within the company—fundraising, maintaining mailing lists, helping the company obtain nonprofit status and audience development. Her efforts are strictly voluntary, but the Flatwater Shakespeare Company is a cause that Hahn feels is well worth her time. "In an intangible way, the arts can enter into a community and work at a level you can't see and make a difference," Hahn said. "The best way I can help is to make this contribution to the community by sharing my business acumen."

Though the Company only recently incorporated, many of the players, technicians and volunteers have worked together for the last five years to deliver critical and box office success. During the summer, they hold productions at the Wyuka Cemetery Swan Theatre, located in the interior courtyard of the old stables—an open-air environment that provides a Shakespeare-like atmosphere.

Kandra Hahn stands in the doorway of the Wyuka Cemetery Swan Theatre.

"When you're at Wyuka, you feel like you're in London during the 16th century," Hahn said. During the winter, the company stages productions at the Haymarket Theatre and even in The Lied Center's Johnny Carson Theatre. Recent shows include "Henry V" and "Measure for Measure."

The Flatwater Shakespeare Company is unique in that it is Lincoln's only professional Shakespeare acting troupe. "Bob Hall is known for minimalist settings and dramatic costumers. The money goes to getting good actors because people come to Shakespeare for the language," Hahn said. In addition to the theatre productions, the Flatwater Shakespeare Company supports the Second Best Bed Society, a support group for the company that meets a week before each production to foster community interest in the play. The group draws upon Lincoln scholars, such as UNL English professor Stephen Buhler who is also the education director of the Company, to contribute their expertise. "Adults can find entertainment through intelligent discussion. They can laugh or be riveted to their seats," Hahn said. Recently, Buhler and Lincoln Public Schools teacher Anne Cognard, gave a Shakespeare lecture to 200 guests at a fundraising event at the Lincoln Country Club. "They had the audience enthralled."

When she's not serving Shakespeare, Hahn also serves on the board of the Nebraska Repertory Theatre. She is regularly called upon as a speaker with the Nebraska Humanities Council, for her speech entitled "It All Started When They Taught Us to Read: Women in America," and she teaches yoga twice a week at the YWCA and the Federal Building. "There are many ways to touch people's lives," Hahn said. "My varied experiences make perfect sense to me."

—Roxane Gay

Forever on campus. It sounds a little fanciful, but how many times have we all thought, "Oh, to be back on campus again!" Those times spent studying and playing hard, of grand thoughts and growing wisdom, have made a great difference in our lives. To long for those halcyon days on campus is natural.

If you can't be there in person, now you can be forever on campus in name. The Nebraska Alumni Association is pleased to announce the Life Wall, a special project to further beautify our Holling Gardens at the Wick Alumni Center and to recognize Life Members of the Association.

By becoming a Life Member, you will be listed on the wall which will grace the north end of the gardens. It's a perfect testament to your love of NU and a permanent reminder of your support to the alma mater.

Life Members are a very special breed of Huskers. They also receive services and benefits beyond that of annual members:
- Quarterly Nebraska magazines – award-winning, uninterrupted service
- Recognition on the Life Wall
- Annual Alumni Resource Guide
- Annual Alumni Wall Calendar
- 70 percent of your Life Member payment is tax-deductible

Get on the Life Wall today by calling us at 888-353-1874 or visiting us online at www.huskeralum.com. Simply click on "Join Now" and you'll be forever on campus!

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Wick Alumni Center - Holling Garden Renovation
View looking Northwest toward donor wall
Bahr Vermeer Haecker Architects

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Russets Win Potato Gun Challenge

Using one of the most significant engineering advancements of the 20th century, students in architectural engineering demonstrated their tremendous knowledge of thermodynamic principles when several teams took on the challenge of refining the design of the potato gun.

Although many may argue that transistors, lasers and digital computers are more useful and far more technologically advanced, none of them has the capability of putting potatoes where they need to be in a rapid and efficient manner. That said, there are many different levels of ability and quality among potato gun designs, which run the gamut from utilitarian to pretty to just plain big.

So, in a bid to dig up the best design concept, the Potato Gun Design Teams competed in a comparative test of ballistic accuracy. The goal was to propel a potato 80 yards—but only one team came close: The Russets. The potato gun designed by team members Jeff Hargens, Brian Kolm and Kenny Reed (inset, from left to right) propelled a russet potato that was just two inches off the mark. That's better than most people could do with a rifle (considering that the target was horizontal), no matter how pretty it is.

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