Biological Systems Engineering

UNIVERSITY OF NEBRASKA-LINCOLN
FALL 2016


Mark Riley

From the Department Head

Hello and welcome to the latest installment of the UNL Biological Systems Engineering Department Newsletter. Classes started at UNL a few weeks ago and all is well in our department. Our undergraduate student enrollment remains strong with 405 students across our three programs and our graduate student population has 57 active students. Collectively this is one of the largest student groups amongst our peer departments across the U.S. Our BSEN freshmen class is nearly two thirds female students.

We had a bumper harvest of awards at the American Society of Agricultural and Biological Engineers conference in Orlando, FL in late July. Students, staff, and faculty brought home numerous awards for significant achievements.

As you've likely heard by now, the UNL team won its first championship at the ASABE International Quarter Scale Tractor Student Design Competition AND the UNL Fountain Wars team won its second national championship in three years. BSE faculty, staff, and students also were recognized with ten national honors.

The ASABE honors received by UNL Biological Systems Engineering faculty include:

- **Santosh Pitla**, assistant professor, was presented the Sunkist Young Designer Award. The award recognizes ASABE members under age 40 for outstanding contributions to the advancement of the profession and to stimulate professional achievement.
- **Curt Weller**, professor in BSE and FDST (and now acting Department head of Food Science at UNL), joined the ASABE Board of Trustees.
- **Wayne Woldt**, associate professor in BSE and SNR, was awarded an ASABE Presidential Citation.
- **Amy Schmidt**, assistant professor in the area of animal manure management in BSE and AnSci, earned the Standard Development Award as the lead author of a paper.
- Superior Paper Awards were presented – one to **Derek Heeren** and the other to **Santosh Pitla** and **Joe Luck**, also a BSE assistant professor.
- **Suat Irmak**, Harold W. Eberhard Distinguished Professor, earned a pair of Educational Aid Blue Ribbon Awards – one each with his postdoctoral students **Vivek Sharma** and **Koffi Djaman**.
- **Jiajia Chen**, research assistant professor, was given Outstanding Reviewer recognition.

Shortly after the ASABE meeting, **Nuwan Wijewardane** was recognized with a graduate student award presented by the International Conference of Precision Agriculture.

We have been fortunate to be able to hire some tremendous new faculty into our department. Since last August, we have added:

- **Troy Gilmore** (jointly with SNR) as Assistant Professor with Research and Extension activities in groundwater hydrology.
- **Aaron Mittelstet** as Assistant Professor with Research and Instruction duties including watershed hydrology.
- **Mark Wilkins**, Full Professor in BSE and FDST and Director of the Industrial Ag Products Center.
- **Forrest Kievit**, Assistant Professor, with research and teaching in biomedical engineering areas including nanoparticle delivery for diagnostics in traumatic brain injury.
- **Theo Lioutas,** Research Professor, charged with building collaborations in food manufacturing.
- Joining us in January of 2017 will be **Rebecca Wachs** (biomedical engineering), **Tiffany Messer** (water quality), and **Yeyin Shi** (ag information systems). All are starting as tenure track assistant professors.

Our student numbers are up slightly from last year based on early numbers which places our total undergraduate enrollment of 405 students in our three undergraduate programs.

This past summer, long time staff member Eileen Curtis retired after nearly 30 years on our campus. Joining us has been Shannon Parry taking her place after playing a similar role in UNL's Department of Modern Languages and Literatures.

There has been substantial turnover in UNL upper administration after the retirement of long time Chancellor Harvey Perlman. Ronnie Green, the former Vice Chancellor of IANR was hired as Chancellor; he previously had been serving as VC for IANR and VC for Academic Affairs. Two active external searches are ongoing. Ron Yoder is currently serving as the Interim VC for IANR and is one of four candidates interviewing for the position. We also have had a change in College of Engineering Dean with Tim Wei being replaced by Lance Perez. And, sadly, VC for Research Prem Paul lost his battle with bladder cancer a few weeks ago. Such changes are not uncommon for higher education, and at UNL these administrators have had lengthy and transformative roles at our institution. We are very fortunate that our budgets are stable, student numbers are strong, and externally-funded expenditures from BSE have reached record levels.

Exciting times in Biological Systems Engineering at UNL. Stop by and say hello when you have the chance. Go Big Red!

Best regards,

Mark Riley
Department Head
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U.S. News Ranks Best 2016 Grad Engineering Schools

Univerity of Nebraska BSE rated among the top graduate engineering schools for biological / agricultural engineering ranking #8 based on tuition, total graduate engineering enrollment, average GRE quantitative score (Master's and Ph.D.) financial aid, and research spending. Biological and agricultural engineers aim to improve the natural world, working toward goals such as safer food, cleaner water, and less polluted air.

Biological Systems Engineering
Department Newsletter

Mark Riley..... Editor
Julie Thomson..... Coordinator
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Contributors: Ben Barelman, Evan Curtis, John Gilley, Derek Heeren, Jenna Hefley, Loren Isom, Nicole Iverson, Deepak Keshwani, Roberto Lenton, Angela Pannier, Amber Patterson, Santosh Pitla, Deidre Sandall, Amy Schmidt, Jeyam Subbiah, Dylan TePoel, Wayne Woldt.

On the cover: UNL sophomore Janelle Adams, graduate student Eric Hofferber, and Dr. Nicole Iverson (center) are looking at carbon nanotube sensors that will be used to investigate inflammatory disease progression, starting with melanoma, on the newly acquired near infrared hyperspectral microscope located within the Iverson Lab.

Angie Pannier demonstrates creating hydrogels to workshop participants.

NEBRASKA BLAST!

BUILDING LASTING AFTERSCHOOL STEM TEAMS

Nicole Iverson (above) and Jennifer Keshwani (below) demonstrate an interactive model showing that even though nanoparticles are small, they can still "stick" to a blood vessel wall.

By Nicole Iverson

Faculty members **Jenny Keshwani**, **Angie Pannier** and **Nicole Iverson** teamed up with Krista Adams from the Department of Teaching, Learning and Teacher Education and Kim Larson from the Nebraska Department of Education to host BME BLAST workshops for Nebraska's K-12 teachers (thanks to the generous funding of Pannier's NSF CAREER grant and the Biomedical Engineering BLAST! grant). This project encourages participating teachers to understand techniques for applying the engineering design process, gain confidence in introducing engineering to their students, and learn about the field of biomedical engineering.

The BME BLAST project gives educators hands-on experiences in biomedical engineering and presents easy to implement, low cost activities that can be used in classrooms and afterschool programs to teach students the engineering design process. The teachers targeted by the BME BLAST workshops serve youth in underserved and underrepresented Nebraska populations. Participating in biomedical engineering activities will increase student interest and understanding of STEM (science, technology, engineering and math) topics and encourage students to pursue STEM careers.

At summer workshops held in Lincoln and Norfolk, participants explored BME through hands-on activities they could take back to their students. These activities highlighted on-going research in biological systems engineering. Participants prepared tissue engineering scaffolds and explored how organs can be made in a lab. A second activity explained how to prepare nanoparticles to act as sensors in the body. Teachers left the workshop with supplies to replicate all of the activities with their students. Attendees will maintain contact with workshop organizers and fellow participants through Twitter (#UNL_BMEed) to share student involvement pictures and stories. The virtual discussion will provide continual support to teachers to increase confidence and competence in teaching engineering design. Check out #UNL_BMEed to see additional images from the workshops!

Our Grant Funding

Next-Gen Underground Sensors

University of Nebraska–Lincoln researchers have earned a $450,000 grant from the National Science Foundation to develop a second generation of underground sensor technology that can automate decision-making when it comes to irrigating crops.

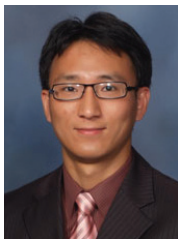
Suat Irmak, the Harold W. Eberhard Distinguished Professor of Biological Systems Engineering, and Mehmet Can Vuran, a Susan J. Rosowski Associate Professor of computer science and engineering, said upgrades to the wireless technology will improve communication ranges and data rates. This will allow farmers to bury tens to hundreds of wireless soil sensors and receive real-time soil information without worrying about machinery impacts on the field.

The researchers have tested previous iterations of their sensor technology at the South Central Agricultural Laboratory near Clay Center, which aims to develop and refine irrigation-assisted practices that improve crop production. Developing next-generation sensors, Irmak said, should ultimately help farmers use water more efficiently during irrigation, "Future irrigation systems will demand easier but robust and more autonomous control to simplify and enhance decision-making. This grant will also enable us to make advances in agricultural science, which has explicit research, Extension and education implications."

The applications of this project could even extend beyond agriculture. The research will enable a wide array of novel solutions, from saving water resources for more food production to saving lives on roadways. Underground sensors with ranges and data rates comparable to conventional wireless devices might also be employed in smart-road infrastructure to help keep tabs on highway conditions.

Underground soil sensor and Suat Irmak.

Joe Luck



Yufeng Ge

Amy Schmidt

TOP SPONSORED PROGRAMS & AWARDS

According to UNL Office of Research, those in the BSE Department receiving grants of $200,000 or more between February and May are:

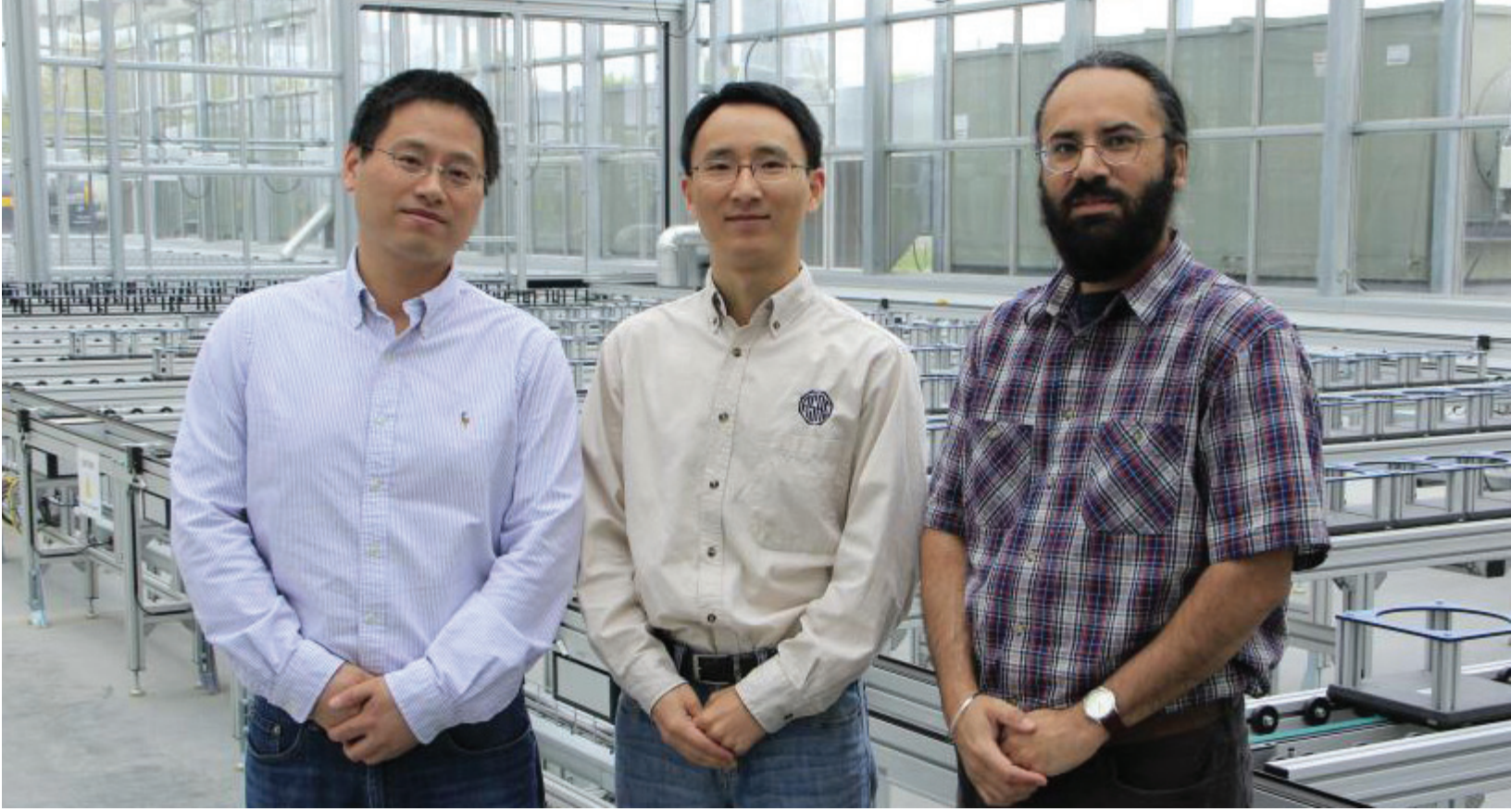
Joe Luck, *et al*, $513,798 *Using Precision Technology in On-farm Field Trials to Enable Data-intensive Fertilizer Management.*

Amy Schmidt, *et al*, $200,000 Department of Agriculture *On-farm Remediation and Prevention of Swine Enteric Diseases.*

Yufeng Ge, *et al*, $534,194 National Science Foundation IDBR: Type A: *Multispectral Laser 3-D Ranging and Imaging System for Plant Phenotyping.*

Dr. Suat Irmak and **Dr. Daran Rudnick** (left) received the Best Paper Award from the *Journal of Irrigation and Drainage*, published by American Society of Civil Engineers Environmental Water Resources Institute (ASCE-EWRI). The paper is titled: "Impact of Nitrogen Fertilizer on Maize Evapotranspiration Crop Coefficients Under Fully Irrigated, Limited Irrigated and Rainfed Settings." The authors were recognized at the World Environmental & Water Resources Congress in May.

Mitch Minarick received SBIR (Small Business Innovation Research) funding for a proposal he submitted that supports a small company he has developed.



From left: Hongfeng Yu, Yufeng Ge and Harkamal Walia have received a National Science Foundation grant to develop a multi-wavelength laser ranging and imaging instrument for phenotyping plant shoots at the whole-plant level.

NSF Grant To Develop New Phenotyping Instrument

With support from a National Science Foundation grant, University of Nebraska-Lincoln researchers are developing a new tool that will help them better identify plant characteristics that are critical to improving crop performance.

The three-year, $534,194 grant will be used to develop an instrument that will improve capacity, sensitivity and throughput for plant phenotyping.

Producing enough food and energy for a world population of more than 9 billion by the year 2050 is the greatest challenge facing agriculture. Researchers around the world are studying plant characteristics, or phenotypes, at high throughput and high resolution to identify opportunities to improve crop performance.

Currently, it is difficult to reconstruct a three-dimensional structure of a plant from its digital images alone. The multi-wavelength laser imaging and ranging instrument being developed as a result of this grant will simultaneously probe chemical properties of plants, such as water, nitrogen and chlorophyll concentration, while also measuring 3-D plant structure, such as leaf orientation and angular distribution. The measurements will tell researchers more information about plant physiology and function.

"The instrument being developed through this research will allow for more efficient phenotype characterization and analysis, which will lead to accelerated crop improvement," said **Yufeng Ge**, assistant professor in the Department of Biological Systems Engineering and an investigator on the project.

See more at: http://ianrnews.unl.edu/nsf-grant-support-development-new-phenotyping-instrument-unl#sthash.jQWoTSee.dpuf

TO SOLVE THE LOOMING GLOBAL FOOD SECURITY CHALLENGE, CROP STRESS TOLERANCE AND YIELDS MUST INCREASE.

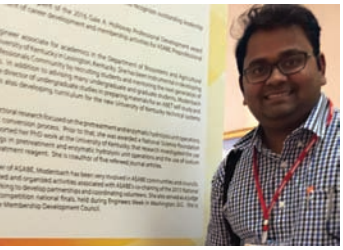
Excepted from Nebraska Today 5/16/2016 by Hailey Steinkuhler/IANR Media)

BSE Harvests Bumper Crop of Awards at ASABE 2016 International Meeting

Wayne Woldt

Presidential Citation

Wayne Woldt, Director of the Nebraska Unmanned Aircraft Innovation, Research and Education (NU-AIRE) laboratory, received an ASABE Presidential Citation for his work on Unmanned Aircraft in Agriculture at the 2016 Annual International Meeting. The award citation read, "*In recognition of his leadership and commitment in soliciting, compiling, writing, and editing material to produce the three-part special series on Unmanned Aircraft Systems published in* Resource *magazine this year.*" The series involved working with multiple authors and co-authors and consisted of 10 articles covering all aspects of unmanned aircraft in agriculture, from research to extension, and sensors to commercial ventures, which appeared in the Mar/Apr, May/Jun, and Jul/Aug 2016 issues of *Resource*. Wayne is actively conducting research and extension on unmanned aircraft; a primary purpose of the articles was to highlight opportunities in agriculture.



Santosh Pitla

Young Designer Award

Santosh Pitla, assistant professor, was presented the Sunkist Young Designer Award. The award recognizes ASABE members under age 40 for outstanding contributions to the advancement of the profession and to stimulate professional achievement.

Graduate student **Scott Speicher** is working on an M.S. in Environmental Engineering. He received a $500 David H. & Anne E. Larrick Memorial Student Travel Grant from the Agricultural Research Division to attend the ASABE meeting and present his research: "Antimicrobial Resistance in Manure Amended Soils."

Educational Aids Blue Ribbon Awards

Suat Irmak and **Vivek Sharma**, *Spatial and Temporal Variation of Corn Evapotranspiration across Nebraska,* and **Suat Irmak** and **KoffiDjaman**, *Basic Soil and Water Resources and Irrigation Engineering/Agricultural Water Management and Related Terminology* in the publications category.

Superior Paper Awards

Joe Luck and **Santosh Pitla**, et al, *Flow, Spray Pattern, and Droplet Spectra Characteristics of an Electronically Actuated Variable-Orifice Nozzle.*

Derek Heeren, et al, *Heterogeneity of Infiltration Rates in Alluvial Floodplains as Measured with a Berm Infiltration Technique*

Standards and Development Awards

Major BSE Contributors to ASABE Standards Development: **Viacheslav Adamchuk,** Positioning and Guidance Systems in Ag, Precision Agriculture, and Ag Electronics.

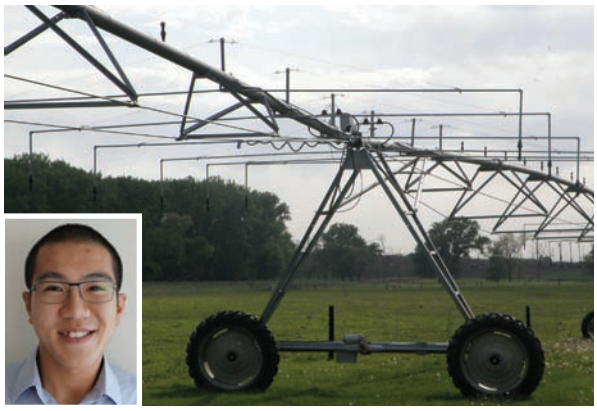
Lead author **Amy Schmidt** and co-authors Saqib Muhktar, University of Florida (*right*), and Teng Lim, University of Missouri (*left*) received the 2016 Standards Development Award for ANSI/ASABE EP585, Animal Mortality Composting.

Board of Trustees

Curt Weller professor in BSE and FDST, joined the ASABE Board of Trustees. He serves as Interim Department Head of Food Science & Technology and as Interim Director Food Processing Center.

Outstanding Reviewer

Jiajia Chen, research assistant professor, was given Outstanding Reviewer recognition at the ASABE meeting. He is pictured below *(center)* receiving the College of Engineering honors for his Outstanding Doctoral Dissertation and shown with advisor Jeyam Subbiah *(right)* and Lily Wang, associate dean, CoE.



Online Map Tool

Pumping Reduction for Variable Rate Irrigation

BSE graduate student **Tsz Him Lo** (Himmy), advised by **Derek Heeren for his M.S.**, developed an online map tool for 49,224 center pivot irrigated Nebraska fields. The tool predicts potential reduction in pumping from using variable rate irrigation technology for each field. The research will be published in *Transactions of the ASABE* later this fall. **Joe Luck, Derrel Martin, Luciano Mateos,** and **Dean Eisenhauer** were also involved in the project. For more information, go to the website at http://heeren.unl.edu/map.

Presidential Graduate Fellowship

Burdette Barker, a Ph.D. student advised by **Derek Heeren** and **Christopher Neale,** received an NU Presidential Fellowship. Only three were awarded to UNL students! Burdette's research focuses on spatial irrigation management based on satellite and unmanned aircraft imagery with the intent of more optimal use of water and has been supported by the Water for Food Global Institute.

Barker, from Fruit Heights, Utah, is a collaborator on a multidisciplinary university research project in which he's investigating the impact of alternative conservation practices on soil moisture available for crop production. As a research assistant at Utah State University, where he received his B.S. and M.S. degrees, Barker focused on measuring crop water use.

A teaching assistant and guest lecturer at UNL, he participates in classroom instruction on irrigation-related topics. He hopes to one day become a faculty member at a land grant university, continuing to identify critical challenges in irrigation management.

Precision Ag Award

Nuwan Wijewardane, *(right)* was presented the Graduate Student Award at the 2016 International Conference of Precision Agriculture in St. Louis, MO. Nuwan's research is on the development of advanced sensing technologies for soil resources. These new technologies will allow us to capture the spatial and temporal variability of soil properties more effectively, enhance our understanding of soil as a 3D continuous entity, and ultimately lead to better management practices. Nuwan is currently working toward his Ph.D. with **Dr. Yufeng Ge.**

Ag Robotics

Santosh Pitla, Tyler Troyer, Ethan Nutter, and Lukas Renker test the field robot.

Tyler Troyer (above) presented a paper on Inter-Row Robot Navigation at AGRICONTROL 2016 in Seattle, a peer reviewed conference dedicated to agricultural robotics: http://www.ifac-control.

The robotics team (**Ethan Nutter, Lukas Renker, CheeTown Liew, Tyler Troyer,** and **Abbas Atefi**) attended the ASABE annual meeting. **Santosh Pitla's** graduate students are working on autonomous navigation of robotic platforms. **Jared Werner's** 46 hp robotic vehicle "Flex-Ro" (Flexible Structured Robotic Vehicle) is shown below.

The first Elenore Gakemeir Swarts graduate awardees, Burdette Barker (left) and Max Twedt (right) with Dr. Carol Swarts.

Swarts Family Biological Engineering Teaching Lab

The Swarts Family Biological Engineering Teaching Lab gives students access to the latest scientific equipment and features found in many of today's professional labs.

The state-of-the art teaching lab in biological engineering courses was made possible with a leadership gift toward its construction from Carol Swarts, M.D., of Seattle, WA.

The Swarts Family Lab is used by undergraduate students for a variety of courses and projects in BSE, including biological materials, biomedical engineering, agricultural engineering, tissue engineering, and more.

Swarts graduated from the University of Nebraska College of Medicine in 1959 and is a radiation oncologist. The lab is named in honor of her parents and brothers.

The Swarts Family Lab has modern scientific equipment, including instruments to determine physical properties of food and biomaterials, instrumentation for signal analysis, sensors for physiological measurements, fluorescence microscopes, and hoods and incubators to grow human cell cultures.

Several years ago, Swarts established a permanently endowed student scholarship fund in memory of her mother, Elenore Gakemeier Swarts, to support Biological Systems Engineering undergraduates. This year, Swarts instituted a graduate student scholarship program.

From left: Carol Swarts and faculty of the lab, Deepak Keshwani, Angie Pannier, and Greg Bashford, enjoy a moment of fun.

BIOLOGICAL SYSTEMS ENGINEERING

HALL OF FAME

Milford A. Hanna

Dr. Milford A. Hanna is this year's BSE Hall of Fame recipient. Hanna received his B.S., M.S., and Ph.D. degrees in agricultural engineering from The Pennsylvania State University in 1969, 1971, and 1973 respectively. He taught agricultural engineering at California Polytechnic State University for two years before joining the agricultural engineering faculty at the University of Nebraska in 1975. Since 1980, his research program included a heavy emphasis on bioprocess engineering and more specifically on finding new industrial (non-food) uses for agricultural commodities such as corn and soybeans. In 1991 he received the Gamma Sigma Delta Research Award.

Milford Hanna

According to Essential Science Indicators℠ from Thomson Reuters, Dr. Hanna's work ranks in the top 1% among researchers worldwide in the field of Agricultural Sciences. He was named a Highly Cited Researcher. His most-cited paper in biofuels is in the 1999 *Bioresource Technology Review*: "Biodiesel production: a review." The manuscript reviewed how vegetable oils and animal fats can be processed for use as mobile fuels with a particular emphasis on the state-of the-art of the transesterification process, which is still the generally accepted method of converting fats and oils to biodiesel today. To date, his broader research efforts have resulted in approximately 350 peer-reviewed publications, which have been cited more than 14,000 times.

Hanna has been awarded five patents. His primary research emphasis was in the area of extrusion process engineering. Other interests that have resulted in significant grant support and/or publications include biodiesel, biodegradable lubricants, physical properties of materials, biodegradable polymers, nanotechnology, and soybean harvesting. Grant funding in the order of several million dollars was received in these research areas from a combination of federal programs (USDA and DOE), state and national commodities boards (corn, soybeans, and sorghum) and companies. He has made numerous trips outside the U.S. to locations world-wide for research purposes.

In 2008, Hanna received the Darrell W. Nelson Excellence in Graduate Student Advising Award. He has been the advisor for multiple graduate students, representing many foreign countries, who have achieved success and notoriety in their field. Hanna became an ASABE Fellow in 1996 and was inducted into the Nebraska Hall of Agricultural Achievement in 2014.

Dr. Hanna was the Director of the Industrial Agricultural Products Center and the Kenneth E. Morrison Professor of Biological Systems Engineering and Food Science & Technology at the University of Nebraska-Lincoln. He retired from the University in June 2011, and returned to serve as interim Department Head from August 2011 to October 2012, and continued to serve as the IAPC Director. As professor emeriti, he serves as the advisor for the Tractor Restoration Club, a group of students that meet at the Larsen Tractor Test & Power Museum. He is also President-Elect of the Friends of the Museum.

Milford and his wife, Lenora, serve the greater community as active Kiwanians, at the local, district, national and international levels. Beyond their local club, they serve as spokespersons and Regional Directors for Kiwanis International's global campaign for children. The Eliminate Project is a partnership with UNICEF to eliminate maternal neonatal tetanus, which causes infant mortality in developing countries. Milford and Lenora are inspirations in this 110 million dollar fundraising effort, which is fully pledged and currently 50% funded. As a result, MNT has been eliminated in 40 countries, but is still a deadly threat in 19 remaining countries.

November 3, 2016 there will be a BSE Hall of Fame celebration banquet honoring Milford Hanna.
Contact Shannon Parry at 402-472-3905 or sparry3@unl.edu by October 27 for event details.

Husker Harvest Days 2016

Linda Schott

Ph.D. candidate **Linda Schott** created the poster pictured for workshops she presented with **Rick Koelsch** and **Amy Schmidt** at Husker Harvest Days 2016 in Grand Island. The event features the latest ag equipment, technology, and management practices. Larsen Tractor Test Museum also exhibited a Co-op tractor in the antique tractor tent.

Water for Food and BSE

By Roberto Lenton

Roberto Lenton

I'm delighted to be joining the faculty of BSE after four and a half years as the Founding Executive Director of the Robert B. Daugherty Water for Food Global Institute (WFI) at the University of Nebraska.

When I arrived in Lincoln in February 2012, my single over-riding goal was to build on the strong record of NU faculty in the water for food arena to establish WFI as an internationally-recognized institute in the field. I'm delighted to say that this goal has largely been achieved. Through the hard work of an outstanding core leadership team and staff, and over 80 Faculty Fellows across the University, WFI has developed a stimulating initial set of pioneering research, policy and education programs both in Nebraska and globally. WFI's work has also benefited from a set of valuable partnerships around the world and a strong strategic plan that moves the Institute from the start-up to the implementation phase. The annual Water for Food Global Conferences have matured to the point of being a highly sought-after gathering for the global water for food community.

Neale

BSE played a vital role in the development of WFI. Several BSE faculty have actively contributed to the development of WFI projects as WFI Faculty Fellows or in other capacities. **Christopher Neale**, WFI's Director of Research, is a BSE faculty member and has vigorously promoted an effective interaction between WFI and BSE.

McCornick

BSE is the tenure home of **Peter McCornick**, an agricultural engineer with a Ph.D. degree from Colorado State University, who was selected as the new WFI Executive Director after a comprehensive international search and who is just the right person to lead the institute in its next phase.

As I transition to the BSE Department, my goals are to write up some of what I've learned during my time in Nebraska through a set of policy papers on topics related to water and food security, and to share some of my global experience at the intersection of science and policy with students and colleagues. In the spring, I will be co-teaching the Seminar on Global Water and Food issues to provide students with a global view of scientific and practical aspects of the role of water in sustainable development and food security.

Field visit with WFI Faculty Fellows to a research site of the Indian Agricultural Research Institute in Mewat District in Haryana, India. From left: Derek Heeren of BSE, Marc Andreini of WFI, Harkamal Walia of Agronomy, Roberto Lenton, and Mike Hayes of NDMC.

MSYM Major Opens Opportunity

Ben Barelman, a junior Mechanized Systems Management major, tells us about the opportunities his degree has opened up for him:

"I think that Mech Systems is a great major for anybody who wants to work in the ag industry because you get to choose from so many courses, and you can focus your studies on whatever area interests you. My time at UNL has helped me to gain many practical skills, including problem solving, communication, and leadership, along with technical knowledge that has transformed me into a professional, competent, and competitive individual.

I am confident that I will be able to market my skills as valuable assets to my future employer after graduation, and being a Mech Systems student makes going to the career fair a fun experience. There are always many employers who are looking to hire employees with the skill set that they know they can expect from someone with this degree.

Despite having many opportunities to work as an intern for large corporations, when I heard that a new business in my hometown needed help, I decided to spend my summer there. I worked for Hansen Brothers Parts and Service in Laurel, Nebraska,

where I analyzed their operation as a system to help them make their workflow more efficient. I did this by finding a computer program to keep track of work orders and provide a database to keep track of everything that goes on. I was also able to apply the material from my business communications class to identify communication challenges. It was very rewarding for me to apply the concepts that I had been learning in college to help the community where I was from. I believe that the back bone of American agriculture is the small rural towns and the people who make them up. It made me proud to be able to help a small business get started and help the small town grow."

Interns in Field Environmental Research

Undergraduate student interns from the University of Nebraska–Lincoln spent 13 weeks of their 2016 summer break participating in an environmental research project to identify "Setback Distance Requirements for Removal of Swine Slurry Constituents in Runoff." The student interns installed research equipment, conducted rainfall simulation tests, and collected and analyzed field data. Funding for the project was provided by the National Pork Board and the field study was conducted at the Rogers Memorial Farm located approximately 10 miles east of Lincoln. An interdisciplinary team of UNL faculty members and USDA Agricultural Research Service (ARS) researchers served as principal investigators for this investigation. **Dr. John E. Gilley**, Research Agricultural Engineer, USDA-ARS, directed the field portion of the study. The objective of this study was to determine the effects of varying setback distance on the transport of antibiotics, antibiotic resistant bacteria and genes, fecal indicators, and nutrients in surface runoff following the land application of swine slurry. This investigation will provide a quantitative assessment of the setback distance required to effectively remove potential contaminants in runoff. Information collected in this study will be presented in peer-reviewed journals and at professional meetings.

Interns from left to right: Alex Chmielewski (MSYM), Carson Jones (METR), Joseph Stapleton (BSEN), Ravi Raghani (BSEN), and Conner Lunn (BSEN)

Frontier Cooperative Internship

Dylan TePoel is a sophomore majoring in Mechanized Systems Management from the small town of Malmo, NE. He says that his passion for agriculture drove him to continue his education at the University of Nebraska. Last summer he received an internship with Frontier Cooperative, working in their agronomy department in North Bend, NE.

TePoel explains, "The summer was full of long days. My first couple weeks there involved soybean treating and seed delivery. The next project at task was tissue sampling. I worked on this for the rest of the summer. Tissue sampling helped me learn a ton about corn and soybeans. I learned how to 'growth stage' the crops, and how to determine different nutrients that the plants are lacking. I also attended various seed meetings and learned about all the different hybrids that companies sell. I learned about different kinds of chemicals and which pests they work on. This internship has opened my eyes to all the different farming techniques that are used throughout Nebraska. It was an amazing experience that I couldn't have gotten anywhere else. These experiences have provided me with valuable knowledge that I can bring back to my family farm."

Left to right: Will Frerichs (Ag Econ), Chadwick Nasagawa (Computer Eng), Derek Zimmerman (Mech Eng), and Kameron Heyen (Chem Eng) repaired the clutch pedal of the John Deere cab in the children's area of Larsen Tractor Test & Power Museum.

Engineering & Ag Students Volunteer

Students in the College of Engineering and in Agricultural Leadership, Education and Communication are volunteering at the Larsen Tractor Test & Power Museum for their Interpersonal Skills for Leadership course to meet the service learning requirement of 20 hours. Most of the students come from Nebraska, but for many this is their first exposure to the Nebraska Tractor Test Law and the history of the Test Lab. The 15 students are majoring in a variety of engineering and agricultural areas.

Partnerships with Brazil

UNL has a longstanding partnership with the University of Sao Paulo, Brazil specifically with their College of Agriculture, called ESALQ. Their Biosystems Engineering department (http://www.en.esalq.usp.br) has many parallels to our BSE Department including substantial expertise in irrigation and water resources and in agricultural machinery. Numerous BSE Faculty have visited this program including **Adam Liska** several years ago, **Christopher Neale** had a sabbatical there before joining UNL in 2013, and in 2015 **Mark Riley** visited as part of a larger UNL contingent that included Ronnie Green. Additionally we have hosted several ESALQ students in research including **Adriano Diotto** for a post doctoral research project in **Dr. Suat Irmak's** team.

Recently, two ESALQ Biosystems Engineering faculty, Dr. Jarbas Honorio de Miranda and Dr. Thiago Libório Romanelli visited UNL and BSE in particular to discuss strengthening our partnership to include exchanges of students between the two programs. One of the challenges in the past has been that ESALQ courses are traditionally taught in Portugese. However, they will soon be teaching graduate level courses in English, including topics of Energy Resources and Environment, Cytogenomics and Epigenetics, Economics, and Management.

Partnering with Biosystems Engineering at ESALQ could provide rich experiences for our students, especially those interested in international agriculture, and to host student visitors and potentially graduate students into our programs.

Jarbas Honorio de Miranda

Thiago Libório Romanelli

First Nebraska Drone Race Champion

Preston Parmley, a senior studying Mechanized Systems Management and participant in the NU-AIRE unmanned aircraft research program, was able to compete in the first Academy of Model Aeronautics (AMA) sanctioned drone race in Nebraska. The race took place at the Strategic Air and Space Museum near Ashland, where competitors raced against the clock through a series of obstacles in four separate heats.

Competitors flew "first person view" drones, sometimes called FPV, that can reach top speeds of 80 miles per hour. "These drones are piloted through virtual reality goggles that give the racers sensation of actually sitting in and piloting the drone," says Parmley. Throughout the competition, Parmley was neck and neck with another competitor until the fourth and final heat. After a focused and efficient final two laps, Parmley won by one second. Parmley says that he is looking forward to the progression of drone racing in Nebraska and will be ready to compete in the next competition.

Preston is a flight assistant for the NU-AIRE Unmanned Aircraft in Agriculture program led by **Dr. Wayne Woldt**, and has recently served as pilot in command for research flights at the Agricultural Research and Development Center.

Fountain Wars Takes 1st Place

The "Beach Ball High Jump" technical task.

The UNL Fountain Wars Team took first place July 20th in Orlando at the 2016 American Society of Agricultural and Biological Engineers (ASABE) Annual International Meeting. In the past three years, the UNL team has won twice and placed second once.

The hands-on competition is for teams of up to six students who design a fountain to complete challenges using PVC pipes, couplers, fittings, valves, nozzles, and pumps. Awards are based on combined scores of a written report, oral presentation, video abstract, construction, technical tasks, and aesthetic display. The two tasks for the 2016 competition were "Beach Ball High Jump" and "Rescue the Dolphin." The primary constraint of this project is the exclusive use of water power.

"Students gain valuable experience in design, construction, hydraulics, mechanics, and teamwork," said advisor **Derek Heeren**, Assistant Professor of Irrigation Engineering and WFI Faculty Fellow. **David Mabie**, Assistant Professor of Practice, is also an advisor.

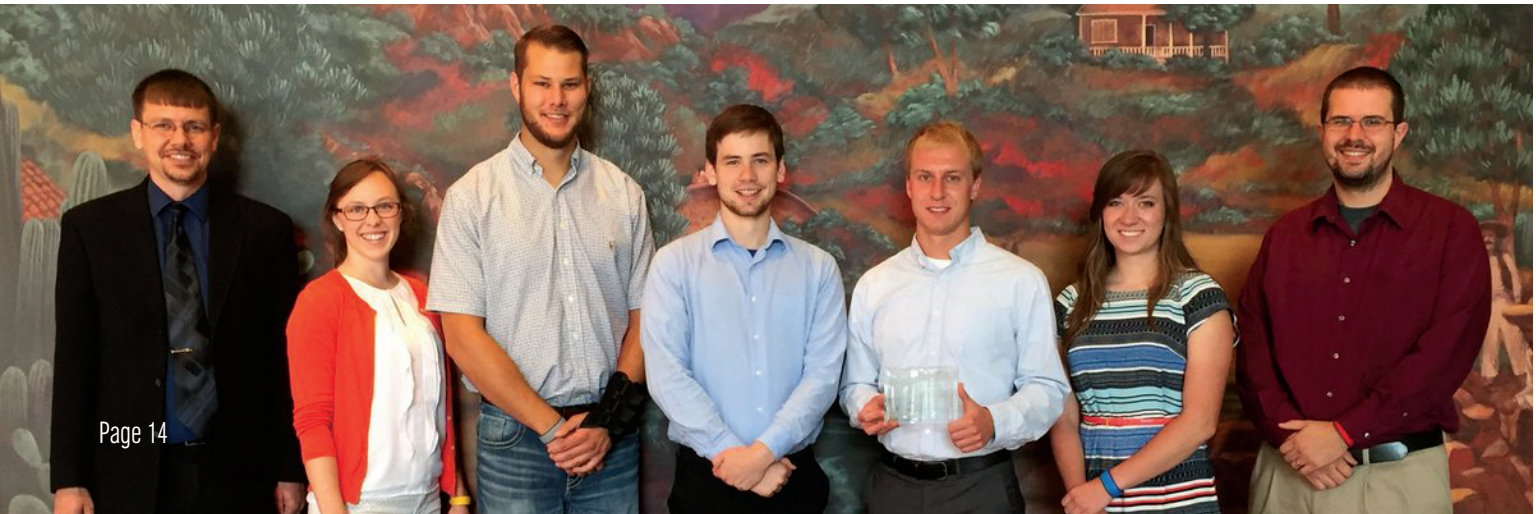
Team members included **Mitch Maguire** (captain), **Anna Siebe** (captain), **Doug Rowen**, **Paulina Guzek**, **Mitch Goedeken**, and **Ellen Emanuel**. **Julia Franck**, **Justin Herting**, and **Karissa Brehm** also contributed to the design of the fountain.

The team sponsors are: The Flatwater Group, Inc., Diamond Plastics Corp., WISH Nebraska, Inc., The Nebraska Section of ASABE, **Dr. Dean Eisenhauer**, **Dr. John Gilley, Drs. Deepak** and **Jenny Keshwani**, **Dr. Derrel Martin**, and **Dr. Mark Riley**. **Alan Boldt** and **Scott Minchow**, BSE staff, provided technical support.

The Beach Ball High Jump task was to launch a beach ball over a high jump standard beginning at a height of 5 feet; with each successful launch, the bar was raised in 1-foot increments up to 8 feet. The UNL design was a water cannon, made of a 10 inch furnace pipe, and a water jet nozzle to propel the ball. Points were based on number of attempts, number of successful jumps, and total accumulated height of successful jumps.

The objective of the Rescue the Dolphin task was to shoot water 6 feet from the pool's edge into one of two cylinders with a 2-inch diameter opening. Inside the second cylinder, a dolphin was placed, and the task was to fill up the cylinders as quickly as possible so that the dolphin reaches the top of the second cylinder and is rescued. The design for this task used the same structure built for the Beach Ball High Jump task, which had a place to mount the PVC pipe, nozzle, and adjustment system and also gave stability to the nozzle, giving the design a higher degree of accuracy.

From left: Derek Heeren (advisor), Ellen Emanuel, Mitch Goedeken, Doug Rowen, Mitch Maguire (captain), Anna Siebe (captain), and David Mabie (advisor). Not pictured: Paulina Guzek. (Photos courtesy of Evan Curtis).



Courtesy photo | ASABE

Top Honors at the International Quarter-Scale Tractor Design Competition

The UNL Quarter-Scale A team took top honors at the International Quarter-Scale Tractor Student Design Competition in Peoria, Illinois, June 2-5. Twenty-seven teams from the United States, Canada and Israel tested their skills at the event hosted by the American Society of Agricultural and Biological Engineers.

The competition is unique among student engineering-design contests, providing a realistic 360-degree workplace experience. Teams are given a 31-horsepower Briggs and Stratton engine and a set of Titan tires. The design of the tractor is up to them and is perfected over the course of a year. Industry leaders judge each design for innovation, manufacturability, serviceability, maneuverability, safety, sound level, and ergonomics. Teams also submit a written design report before the competition. At the event, they sell their design in a formal presentation to industry experts playing the role of a corporate management team. Finally, machines are put to the test in three tractor pulls, a maneuverability course, and a durability course.

The competition gives team members an opportunity to experiment with complex technology that's becoming increasingly common in the industry. That experience is helpful to tractor team members, mostly agricultural engineering majors, according to **Roger Hoy**, professor in BSE and tractor team advisor.

"In addition to learning a lot about communication, leadership, teamwork, fundraising, testing, and development, the team members got a glimpse into future career opportunities in agricultural engineering," Hoy said.

The UNL agricultural engineering program is one of the nation's top programs and emphasizes hands-on applications.

Team captain and recent graduate **Ryan Hanousek** incorporated his efforts on the team into his agricultural engineering senior capstone project. "Our tractor was built in record time, so we were able to spend all spring, including spring break, testing and trying to prevent any failures that could happen at competition," he said. "It was great to be rewarded for our hard work with a win and establishing the University of Nebraska-Lincoln as one of the top tractor teams in the world."

UNL has enjoyed numerous top-10 and top-five finishes since the event's inception in 1998. The team finished out of the top 15 in 2015, but UNL earned most-improved honors in 2016.

This is the first win for UNL's Quarter-Scale A team, which is made up of juniors and seniors. The UNL X team, made up of freshmen and sophomores, also fared well at the competition, winning the design category and placing third overall in the X team division.

The performance gives team members momentum for the 2017 competition, Hoy said, "They were already sketching new designs for next year on the drive back to Lincoln."

Joe Luck, BSE assistant professor, is also a team advisor.

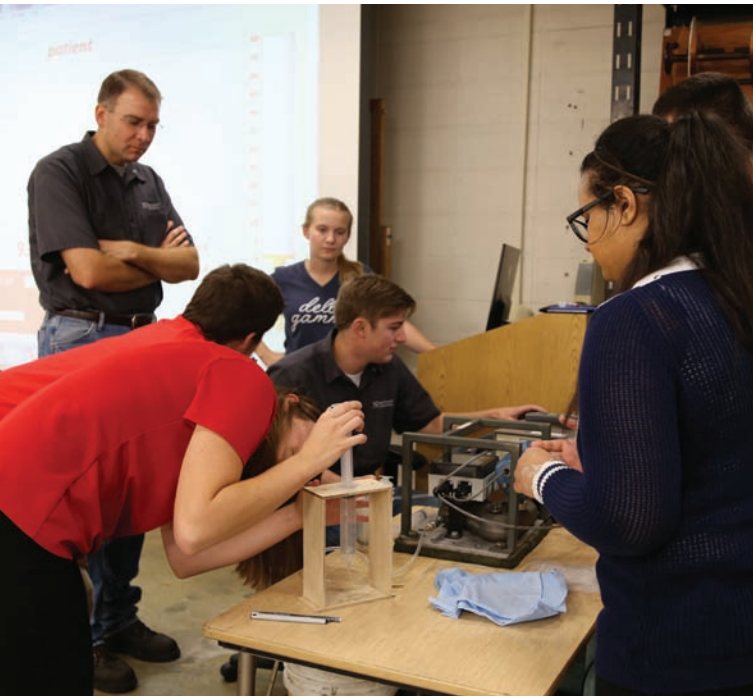
A TEAM:
Micah Bolin (captain)
Sydney Gard (captain)
Ryan Hanousek (captain)
Evey Choat
Travis Classen
John Evans
Greg Frenzel
Caleb Lindhorst
Ethan Mosel
Rachel Noe

X TEAM:
Josh Murman (captain)
Colton Rathman (captain)
Jason Shultis (captain)
Jonah Bolin
Noah Bolin
Jordan Bothern
Keith Kopcho
Zak Kurkowski
Jack Moore
Anna Siebe
Devon Vancura
Seth Wetovick

Rapid Design Challenge

Earlier this semester, the AGEN/BSEN 470 class completed their Rapid Design Competition. This challenge was an opportunity for students to meet and interact with their senior design group and begin to develop design techniques. From this assignment, teams learned to work together and about how to go through a design process. Each team was asked to dispense water from a syringe at a flow rate of 12 ml/minute without the use of electricity. All designs also had to be stand-alone and easy to use. The winning group was based on performance and instructors' choice for most innovative design. The winning team members were **Luke Johnson**, **Jonathan Nielsen**, **Aaron Steckly**, and **Bennet Turner**. **Dr. Roger Hoy** is their faculty manager.

Students Katie Meiergaerd, Courtney Kinser, and David Lillyman explain their battery powered design.



Test Lab employees Engineer Rodney Rohrer and students Jordan Bothern and Marc Kramer-Davis help test a final design.

Kari Heck, Joey Stapleton, Austin Helmink, and Breck Ostrander show Dr. Forrest Kievit their design.

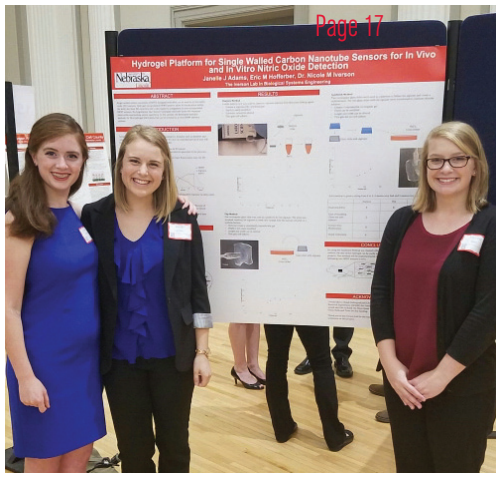
Dr. Angie Pannier speaks with Karlie Knoepfler, Purity Muhia, Alec Fuelberth, and John Shook about their design.

Kevin Real, Tori Bart, Sarah Heindl, and Allison Porter demonstrate their design to Dr. Derek Heeren.

Summer Research Symposium

Joe Luck and Anna Siebe.

Jiajia Chen, Yulan Tang, Jeyam Subbiah.



Caroline DeBrota, Janelle Adams, and Victoria Bart.

BSE faculty advised UCARE and REU (Research Experiences for Undergraduates) students for the summer research symposium.

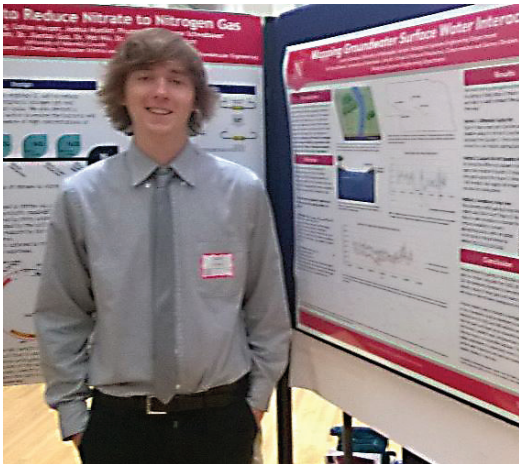
Josiah Johnson, advised by **Troy Gilmore**, presented his UCARE project poster "Mapping Groundwater Surface Water Interactions."

Anna Siebe (MSYM) advised by **Joe Luck**, presented a UCARE project: "Height and Pressure Test for Improving Spray Application."

Yulan Tang, a visiting student from Northwest Agriculture and Forest University, China, funded through the Undergraduates International Exchange Fund, was advised by **Jiajia Chen** and **Jeyamkondan Subbiah**. She presented her work: "Modeling of Radio Frequency Heating of Mashed Potato and Egg White Powder." Subbiah also collaborated with Dr. Dvorak to advise undergraduates: Nathan Rice studied *Energy and Water Use in Beef Packing Plants*, funded by a USDA-STEC grant; Courtney Kinser studied *Energy and Water Use in a Large Beef Packing Plant*, funded by an EPA-P3 and USDA-STEC grant; and Sam Hansen studied *Characterization of Waste Water from Beef Packing Plants*, funded by an EPA P-3 and USDA-STEC grant.

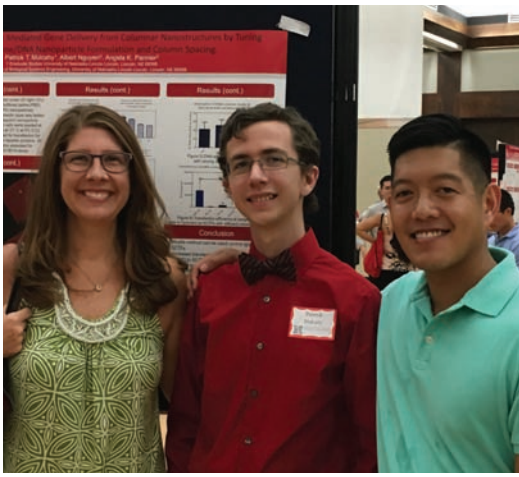
Nicole Iverson advised UCARE students, Janelle Adams and Victoria Bart, and REU student Caroline DeBrota from Rose Hulman Institute of Technology. They worked on "Hydrogel Platforms for Single Wall Carbon Nanotube Sensors for In Vitro and In Vivo Nitric Oxide Detection" and "Single Wall Carbon Nanotube Fluorescence Detection to Quantify In Vitro and In Vivo Nitric Oxide Concentrations."

Angela Pannier advised Patrick Mulcahy, an REU student from the Florida Institute of Technology, Keegan McGill, University of Nebraska-Kearney, Idea Network for Biomedical Research Excellence (INBRE) scholar, and Kelly Broad, a high school senior from Lincoln Public Schools' Science Focus Program. Patrick presented "Nanostructured Surfaces for Substrate Mediated Gene Delivery" and Kelly presented "Mechanisms of Improving Gene Delivery to Human Mesenchymal Stem Cells." Keegan presented "Zein Films for Substrate Mediated Gene Delivery" at the INBRE annual meeting.



Josiah Johnson

Angela Pannier and Kelly Broad.



Pannier, Patrick Mulcahy, and graduate student Albert Nguyen.

What's New?
Update your profile at: bse.unl.edu under the *Alumni* tab

What's News?
See *About the Department* for news archives and past issues of BSE Newsletter

bse.unl.edu

Coming & Going


Forrest Kievit


Theo Lioutas


Mark Wilkins

Forrest Kievit has become Assistant Professor in BSE. His research involves developing nanoparticle-based delivery vehicles for transport into the brain for more effective brain cancer and brain injury treatments. His career goal has been to translate a nanomedicine into clinical use to improve the survival and quality of life of neurosurgery patients.

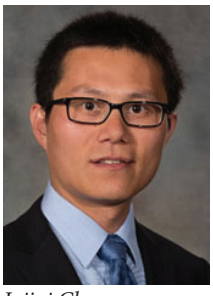
Theo Lioutas joins us as BSE Research Professor. He has significant experience managing and utilizing agricultural science and technology to produce proprietary crop innovation. Born and raised in Greece, he is multilingual, proficient in English, Greek, French, and Spanish.

Mark Wilkins became Director of the Industrial Agricultural Products Center in BSE and the Department of Food Science and Technology. His research interests are in bioprocessing and food processing. His teaching interests are biochemical engineering, food engineering, ethics, and short-term study abroad.

Humeshkar "Humesh" Nemala joined us as Research Assistant Professor working with Drs. Joe Luck and Santosh Pitla in agricultural data science. Humesh was most recently at Illinois Wesleyan.


Humesh Nemala


Shadi Othman

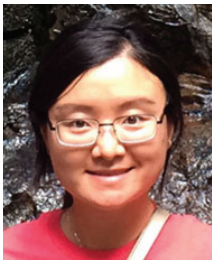

Jaijai Chen

Shadi Othman moved to the faculty at University of the Pacific, Stockton, California.


Shannon Parry

Shannon Parry started in September as BSE Administrative Associate replacing Eileen Curtis. Shannon has been at UNL for about 11 years, most recently in a similar role in Modern Languages and Literatures.


Tiffany Messer


Yeyin Shi


Rebecca Wachs

Tiffany Messer, Assistant Professor, will join BSE in January 2017. She researched nutrient and insecticide fate and transport in stream systems. Her research focus is on emerging technologies such as nutrient recovery from animal manures, arising issues in water quality associated with the fate, transport and remediation of emerging contaminants in stream, wetland, and agricultural ecosystems, and assessing risk management and/or mitigation of water-borne contaminants. She will be teaching courses in water quality, environmental engineering, and related areas.

Yeyin Shi, Assistant Professor, joins BSE in January 2017, with a combined research and extension appointment. Her primary interest is in agricultural information systems. Her recent research is UAV applications in agronomic research and high-throughput field-based phenotyping.

Rebecca Wachs will join the BSE's Biomedical Engineering faculty in January 2017. Dr. Wachs research uses her diverse skills in orthopedics, neural engineering, and clinical translation to develop novel interventions for the treatment of low back pain. She proposes to target low back pain with three major arms of research including: engineered biomaterials to prevent and reverse nerve growth, targeted delivery of antioxidants to modulate inflammation, and development of in vitro test beds to mimic disease progression. Dr. Wachs is excited about the prospect of building diverse collaborations at UNL and teaching the next generation of engineers.

Jaijai Chen moved to an Assistant Professor of Practice role in the Food Science and Technology Department with the Xi'an Jiaotong University, China "3+1" Program, an international collaboration between UNL and China. (Students in the program travel to the UNL campus to continue their studies.)


Eileen Curtis

Eileen Curtis, Administrative Associate, retired in August after 30 years serving the BSE Department. Eileen served in various capacities in Biological Systems Engineering, including working at Tractor Test and assisting three Department Heads. She was a recipient of the IANR Kudos Award. In her retirement she is looking forward to spending more time with her family and grandchildren.

SCHOLARSHIPS

AGP Biological Systems Engineering Student	Emily Bender Turner Hagen
T-L Irrigation, Leroy W. & Jeane E. Thom	Kelsey Bohling Micah Bolin Isaac Frerichs Mitch Herbig Jonathon Jahnke Caleb Lindhorst Brendan Meyer Joshua Murman Aaron Steckley Seth Wetovick
John Deere	Jonah Bolin Jared Donoghue Joshua King Kyle Lindhorst Zoie McFarland
Dr. & Mrs. William E. Splinter	Ravi Raghani
Wayne E. & Virginia R. Thurman	Keith Bendix Junior Hilker Dillon Wordekemper
Elenore Gakemeier Swarts Distinguished	Austin Helmink Deidre Sandall Emily Thrailkill
Orve & Scott Hedden Memorial	Amanda Van Sant
Glen D. Chambers	Paulina Guzek
Warren P. Person Memorial	Alec Fuelberth Michael Kirstein
Fred R. Nohavec	Clayton Blagburn
Dirk & Janice Petersen	Zak Kurkowski
Ken Von Bargen Student Support	Craig Hruska Cody Kneifl
Edgar Rogers Memorial	Benjamin Barelman Michaela Horn
George Milo Peterson	Parker Wallin
Ivan D. Wood Memorial	Troy McDonald Noah Johnson Dylan TePoel
Case New Holland	Noah Bolin Jordan Busboom Rylan Dvorak Jacob Schlick
John Sulek Memorial	Daniel Behrens
Paul E. & Mary Beth Fischbach & Family	Josiah Johnson Anthony Meusch
Glenn J. & Maria L. Hoffman	Samantha Nelson
Mr. & Mrs. W. F. Hoppe, Sr. Memorial	Nicholas Jarecki
Leonard G. Schoenleber	Catherine Rock
Jack Schinstock	Jacob Brettman
Lloyd W. & Margaret V. Hurlbut Memorial	Olivia Bures Max Hjermstad
Tom Thompson Memorial	Hunter Miller
Leslie & Harriet Jochens	Nathan Boomsma Taylor Kool Arianna Spellman

GRADUATION

Spring

AGEN

Dillon Clayton
Julia Franck
Adam Frerichs
Sydney Gard
Ryan Hanousek
Zachary Hermanek
Justin Herting
Ian Schuster
Megan Tucker

BSEN

Paula Andrie
Aaron Cronican
Christopher Davidson
Zachary Duncan
Timothy Jensen
Christian Jewett
Danni Liu
Mitchell Maguire
David Marshall
Mackenzie Miller
Logan Neal
Kevan Reardon
Jaideep Sahni
Halle Swann
Jared Thomsen
Nicholas Vandenberg
Alex Van Lent
Blake Wagner
Katelyn Watts
Megan White

MSYM

Derek Bracht
Matthew Erickson
Ryan Flynn
Kip Frates
Greg Frenzel
William Hoffman
Trenton Jakub
Jared Korth
Aaron LaPointe
Nathan McCormick
Kerry McPheeters
Ethan Mosel
Taylor Norquest
Chase Peterson
Garrett Tooker
Lance Wiseman

Summer

BSEN

Ashley Eure
Yen Xin Lu
Sophia Walsh

MSYM

Alexander Shook

THE DEAN'S LIST

Spring 2016

AGEN

Kelsey Bohling
Jonah Bolin
Noah Bolin
Dillon Clayton
Lilian da Silva
Jared Donoghue
Julia Franck
Adam Frerichs
Joshua Krueger
Joshua Murman
Aaron Steckly
Seth Wetovick

BSEN

Janelle Adams
Ellie Ahlquist
Zainab Alsughayer
Freshta Baher
Emily Bender
Conner Beyersdorf
Clayton Blagburn
Connor Blankenau
Nicholas Bohlim
Kenneth Bristol
Madison Burger
Kevin Cahoy
Jocelyn Carter
Brinson Chapp
Connor Christensen
Hannah Christian
Christopher Davidson
Eric Davis
Rebekah DeFusco
Erica Dolph
Kyle Downey
Drew Dudley
Katherine Dudley
Zachary Duncan
Collin Erickson
Mitchell Frischmeyer
Katherine Fye
Megan Gren
Paulina Guzek
Blake Hass
Jason Hawkins
Kari Heck
Erica Hedrick
Austin Helmink
Bailey Helmink
Mary Hernandez
Philion Hoff
Cody Houdesheldt
Alexandra Hruby
Lauren Hunt
Baron Huntwork
Neng Huynh
Zachary Janecek
Madeline Johnson
Emilie Johnson
Jacob Lenz
David Lillyman
Julia Lindgren
Danni Liu
Conner Lunn
Alexander Magsam
Alison Manske
Jacob Meyer
Mackenzie Miller
Hunter Miller
Andrew Minarick
Mitchel Misfeldt
Michael Moeller
Bailey Monroe
Troy Nelson
Samantha Nelson
Alex Ober
Megan Pamperin
Meaghan Pecha
Anna Petrow
Logan Piening
Elizabeth Pollock
Allison Porter
Ravi Raghani
Kevin Real
Kevan Reardon
Matthew Rennau
Nathan Rice
Dylan Rogers
Douglas Rowen
Emma Rutherford
Deidre Sandall
Nicole Schwery
Nicholas Seier
John Shook
Dillon Soukup
Joseph Stapleton
Loren Steinman
Erin Stevens
Ryan Stutzman
Jared Thomsen
Emily Thrailkill
Anna Toner
Jordan Verplank
Sophia Walsh
Benjamin Wankum
Samantha Wattier
Katelyn Watts
Megan White
Brett Whorley
Maranatha Zelt
Carly Zimmer
Kristina Zvolanek

MSYM

Matthew Erickson
Ryan Flynn
Turner Hagen
Jared Hendricks
Seth Lackas
Nathan McCormick
Kerry McPheeters
Jacob Rafert
Nathan Tederman
Parker Wallin
Colby Wilkinson

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To arrange a gift, contact:
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