Biological Systems Engineering

Improving Our World

Photo Credit: NASA

UNIVERSITY OF NEBRASKA-LINCOLN
FALL 2017

Interim Department Head


David Jones

I am extremely fortunate to serve this tremendous department as interim Department Head. I look forward to working with all of our fine faculty and staff as we move forward addressing the issues important to our state, our students, and the world. We are striving to live out our mission of teaching, research and extension in the important areas of biomedical engineering, bioenergy production, bioenvironmental engineering as well as our long history of dedication to agricultural engineering, machinery and controls, and soil and water conservation engineering, and other emerging areas.

We are upgrading the publishing of the BSE Magazine, now available only online this issue and in the future. Be sure to see https://engineering.unl.edu/bse/newsletter/ for our BSE Magazine under the "about the Department" menu.

You may also subscribe to our weekly news which features departmental events, awards, and other items that are important to our community. Prospective students, alumni, and any others who may be interested are welcome to subscribe.

We have a big vision for the future to meet the research demands and education needs of our great state and the changing world. We are proud of the accomplishments of our students which you will see in this issue as well as our award winning faculty. I hope you enjoy this magazine.

For more information on our programs please visit us online;

http://bse.unl.edu/, like our Facebook page "Department of Biological Systems Engineering at UNL", or twitter @BSE4life. Enjoy your visit. We welcome your feedback.

Best regards,
David Jones, Interim Department Head
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In this Issue

What's New?

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What's News?

See About the Department
for news archives and
past issues of BSE Magazine

Biological Systems Engineering Magazine

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Sheila Smith.....Graphic Artist

New Grad Program: Dr. Munoz-Arriola Paints the Big Water Picture

By Ronica Stromberg

In his high school days, Professor **Francisco Munoz-Arriola** realized something that escapes most people: Water is more valuable than gold.

Without it, none of us could survive.

Munoz-Arriola also realized the perils of water—hurricanes, floods, droughts and, probably the greatest peril of all, a shortage of good, clean water to support life. Knowing the world's population could double within his lifetime, Munoz-Arriola wondered whether a day would come when there wasn't enough clean water for everyone.

He saw the bigger picture and wanted to address it with his life's work.

Munoz-Arriola went to college, earning a bachelor's degree studying the effects of point and nonpoint source pollutants on coastal areas, but this addressed only part of the picture for him.

He then earned a master's degree evaluating the effect of oil pollution on benthic organisms, and that addressed another part.

Finally, he earned a doctorate in Civil and Environmental Engineering and came to the Biological Systems Engineering Department at Nebraska to discover ways to build resilience in water systems and sustain them for future generations. He developed expertise in collecting and interpreting data for multiple users and in forecasting extreme events like floods and droughts through use of numerical, statistical, and data-driven models.

"Through this journey around water, I recognized that water is multidimensional," he said. "Water is political. Water is environmental. Water is the earth and its inhabitants. So, water is the glue of our system that helps us not just to survive but to thrive and support what we do, what we are."

He also recognized that water, food and energy systems are interconnected with one another and the ecosystem and that concerns about them cannot be resolved separately. Such local to global concerns run across academic disciplines, yet no one discipline has completely addressed them.

Munoz-Arriola sought out professors with similar interests in this food-water-energy-ecosystem services nexus and teamed with professors Craig Allen from the School of Natural Resources, Sebastian Elbaum from the Computer Science and Engineering Department, Nancy Shank from the Public Policy Center, and Dirac Twidwell from the Department of Agronomy and Horticulture.

This year the team received a $3-million National Science Foundation Research Training grant to start a graduate program in the School of Natural Resources to better understand and build the Platte River Basin's resilience and sustainability.

Photo: Water for Food Global Institute at the University of Nebraska

Francisco Munoz-Arriola

"My biggest achievement is that I am part of this interdisciplinary group that is targeting to discover new things, breaking the barriers built by disciplines," Munoz-Arriola said.

Students in the program will come from various academic disciplines and work across them to find answers to questions about how to sustain ecosystems like the Platte River Basin and all the various groups depending on them. They will be looking at scales—farmers who use water from the Platte River Basin and the Ogallala aquifer to grow crops, people who use it for drinking water or for recreation, wildlife that depends on it, and so on—and asking the questions, Can we balance this? Can we develop cross-scale resilience in the Platte River Basin?

"We may need to ask what kinds of compromises we should make for the basin to continue providing economic benefits to families through agriculture and at the same time providing benefits to the ecosystem and to families accessing those ecosystems," Munoz-Arriola said. "Is there a point where we can support and sustain all of these activities for a long time, and even more, can we sustain these activities when we are continually vulnerable to extreme events?"

He said students will also be studying panarchy theory, the idea that there are mechanisms developed at all levels, such as from plant to ecosystem to biome, to help the plants, ecosystems, biomes, or whatever recover from exposure to stressors like extreme events. They will be looking at the response time of policy makers to extreme events and asking the question, Can we develop the policies or strategies based on panarchy concepts or can we improve our ability to predict extreme events in such a way that policy makers can respond faster?

"Integrating all of these concepts is the big picture of how we can sustain agriculture and the ecosystems," Munoz-Arriola said. "Everything is interconnected."

And now the graduate program his team has started will be too.

A Nebraska Extension program titled "University of Nebraska Lincoln–Testing Ag Performance Solutions" (UNL-TAPS, www.TAPS.unl.edu) was developed by **Daran Rudnick** (Irrigation Management), Matt Stockton (Ag Economics), Chuck Burr (NE Extension), and Rodrigo Werle (Cropping Systems) in partnership with the Nebraska Water Balance Alliance (NEWBA) in the fall of 2016 to enhance the engagement of agricultural producers to improve resource use efficiency and farm profitability by providing a common platform for peer-to-peer learning with participation by University scientists and industry personnel. The program provides a touch stone where people can observe and use new ideas, test conventional wisdom, and discover better ways to do business in an environment of friendly competition.

UNL-TAPS hosts the annual farm management competition at the West Central Research and Extension Center (WCREC) in North Platte, where producers compete against each other for: 1) most profitable farm, 2) highest input (water and nitrogen) use efficiency, and 3) greatest grain yield. The participants are responsible for making key management decisions, including irrigation scheduling; nitrogen fertilizer amounts and application (via pre-plant, side-dress and fertigation); corn hybrid selection; seeding rate; crop insurance selection; and marketing choices of their grain yields.

The 2017 competition included fifteen "farms" made up of producers, scientists, or undergrad agronomy students who were located across west central Nebraska (http://taps.unl.edu/2017-taps-contestants). On paper each "farm" includes 3,000 harvested acres for the purposes of making decisions. Each team's choices, submitted through a password protected web form, are implemented on three randomized plots irrigated by a variable rate irrigation system at WCREC. Through the competition, producers are introduced to, and are able to use, new and developing technologies, tools, methods and other resources without exposing their whole operation to unknown results. Extensive data is collected on the plots to provide statistical standing for the farm management strategies and help guide future research and extension programs.

Several in-season extension workshops and field tours have occurred throughout the year, including contestant panel discussions about the various management strategies, field tours of the plots, instrumentation/technology workshops, and program updates. The highest scoring "farm" from each category will be recognized at an awards banquet on December 12, 2017.

Film prepared from chicken feather keratin. Black powder was added to film formulation as a filler for effective sunlight absorption.

USDA Research Grant for IAPC Mulch Film Project

Dr. Sibel Irmak, BSE Research Associate Professor, and Samuel Wortman, Assistant Professor of Agronomy & Horticulture, in collaboration with **Loren Isom**, Assistant Director, Industrial Agricultural Products Center (IAPC) will lead a project funded by a USDA research grant.

Sibel Irmak and Loren Isom

Dr. Irmak and her colleagues will develop biodegradable mulch film formulations, based on blends of various renewable raw materials, for application to specialty crops such as tomatoes and peppers, in greenhouse and agricultural field trials, in order to evaluate protection from common weed infestations.

The Nebraska Department of Agriculture awarded the project funds under the USDA's Specialty Crop Block Grant Program. The project intends to develop biodegradable mulch films that meet required properties for agricultural applications using low cost, abundant, and non-toxic raw materials.

Mulch films with preferred properties can provide important benefits such as warmer soil temperatures to enhance crop germination, increased soil moisture, reduced insect and weed abundance, and reduced pesticide use. Degradable materials and their end-products should be environmentally safe, and precautions should be taken to prevent them from getting into surface and/or groundwater resources, which can negatively impact the quality of irrigation and drinking water resources. Biodegradable mulch films made from natural sources can help to reduce this hazard. In the project, protein-based mulch films will be studied as potential mulch films that can be applied in agricultural production fields. These films can be developed to release nitrogen into the soil during the degradation process, potentially reducing inorganic fertilizer demand in specialty crops.

Pannier Earns NIH Award To Enhance Gene Therapy

Adapted from *UNL Today* by Gillian Klucas | Research and Economic Development

Dr. **Angela Pannier** has received a 2017 National Institutes of Health Director's New Innovator Award to develop novel methods that improve use of adult stem cells in gene therapy, a promising tool for treating a variety of diseases.

This prestigious honor supports exceptionally creative, early-career researchers pursuing innovative projects with the potential to transform their field of study. The five-year award provides nearly $2.2 million in funding and is designed to give early-stage researchers the flexibility to try bold new approaches that could have a major impact on biomedical or behavioral research. Pannier is the first University of Nebraska–Lincoln researcher to earn this honor. "I'm excited to use some new strategies that have never been used in the field before," she said. "We'll be able to understand the system on a much bigger scale and move forward into applications."

Gene therapy is the technique that introduces genetic material into patients' cells to treat diseases. It has long held promise for tackling a wide variety of medical conditions, including combating cardiac and neurologic diseases, treating genetic disorders and cancer, repairing wounds and improving organ transplant outcomes. But finding effective, safe methods of delivering genes to cells remains a significant hurdle. Modifying a patient's own stem cells to incorporate the therapeutic genes is a primary focus. Stem cells have the ability to self-renew and differentiate into many different cell types. Pannier is investigating ways to promote gene uptake by "priming" stem cells—that is, altering them in ways that overcome barriers to incorporating the nonviral gene package—and already had success, discovering that a common steroid drug, a glucocorticoid, markedly improved nonviral gene uptake. The NIH award will allow her to significantly ramp up her search for other "priming" drugs.

Pannier and her team will also conduct research into better understanding the biological mechanisms of gene delivery, such as why priming drugs affect gene delivery, as well as using mathematical modeling with her collaborator Tadeusz Wysocki, professor of electrical and computer engineering, which will further research into improving priming strategies and delivery methods for nonviral gene therapy. "Our hope is that we can find a clinically approved drug or combination of drugs that can dramatically improve gene delivery . . . we can then start applying this idea to therapeutic applications," Pannier said. She has established an interdisciplinary collaborative network to help expedite promising applications. Collaborators include faculty at the Institute of Agriculture and Natural Resources; University of Nebraska Medical Center; and the U.S. Meat Animal Research Center.

Pollen-Mediated Gene Flow Research

Dr. **Suat Irmak** is a member of a scientific team who published a paper in the prestigious journal *Nature*. He stated that the paper makes a significant contribution to the scientific community and is an excellent example of integrating different scientific disciplines for enhancing scientific understanding and addressing real world issues. Some data from one of Dr. Irmak's 11 NEBFLUX (Nebraska Surface Water and Energy Flux Measurement, Modeling, and Research Network) flux towers was used in the research. The paper is titled "Pollen-mediated gene flow from glyphosate-resistant common waterhemp (Amaranthus rudis Sauer): Consequences for the dispersal of resistance genes (D. Sarangi, A.J. Tyre, E.L. Patterson, T.A. Gaines, S. Irmak, S.Z. Knezevic, J.L. Lindquist, and A.J. Jhala)" (http://www.nature.com/articles/srep44913).

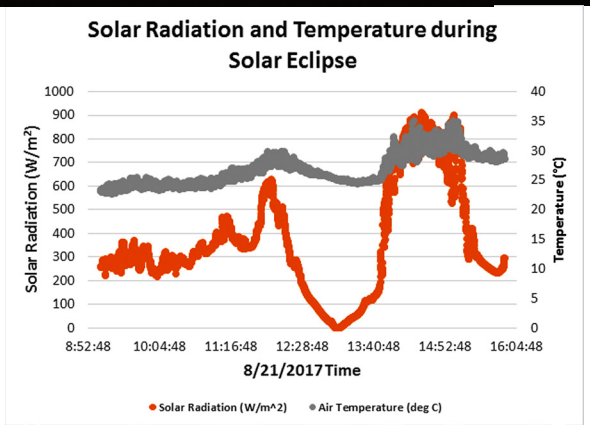
The research was carried out under the leadership of Dr. Amit Jhala with his former Ph.D. student Dr. Debalin Sarangi as part of Dr. Sarangi's Ph.D. research at the South Central Agricultural Laboratory. The research quantified pollen-mediated gene flow (PMGF) from glyphosate-resistant (GR) to -susceptible (GS) common waterhemp using a concentric donor-receptor design. In an extensive research campaign, more than 130,000 common waterhemp plants were screened and 26,199 plants were confirmed resistant to glyphosate. Frequency of gene flow from all distances, directions, and years was quantified with a double exponential decay model. Amplification of the target site gene, 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS), was identified as the mechanism of glyphosate resistance in parent biotype. It was determined that the EPSPS gene amplification was heritable in common waterhemp and can be transferred via PMGF, and also correlated with glyphosate resistance in pseudo-F2 progeny. This is the first report of PMGF in GR common waterhemp; the results are critical in explaining the rapid dispersal of GR common waterhemp in Midwestern United States.

Dr. Irmak said that it is always a pleasure for him to interact and work with Dr. Jhala and his team, and he appreciates the quality of Dr. Jhala's research program.

Solar Eclipse Research

by David Mabie

On August 21, 2017, a total solar eclipse passed through Lincoln. The eclipse began around 11:30 AM with totality occurring around 1 PM. The figure was generated through collecting solar radiation and temperature data on August 21st during the entire day. The morning of August 21st was quite cloudy, which can be clearly seen in the figure due to the lower solar radiation and temperature occurring during the AM. The eclipse, however, clearly reduces the total available solar radiation during the day, as can be seen in the figure with the solar radiation completely dropping to zero during totality. One interesting observation noticed in the figure is how temperature typically lags behind incoming radiative flux as the lowest temperature are observed occurring a few minutes after totality. This same phenomenon is similar to why months like August are often warmer in the Midwest despite the peak of available radiation occurring during the summer solstice on June 21st.



Climate Change Report Makes Headlines

Adam Liska led a team of researchers in calculating the devastation that a single nuclear warhead could cause. The findings were reported in *Environment* (July 6) and in *Nebraska Today* (excerpted below). The story was also picked up by *The Daily Mail* in the United Kingdom and gizmodo.com.

Why a Single Nuke's Impact Shouldn't Only Be Measured In Megatons

NEBRASKA EXPERTS: EVEN 'LIMITED' NUCLEAR STRIKE COULD CAUSE WIDESPREAD DROUGHT, FAMINE

from Leslie Reed, University Communication

In a new report, a group of experts led by **Adam Liska** have concluded that even a single nuclear strike could lead to widespread drought and famine that could cost a billion lives. As the notion of nuclear hostilities leaps from its old, Cold War perch and back into modern debate, new calculations by UNL researchers show that even a limited nuclear strike could have disastrous global consequences.

During five decades of the Cold War, the doctrine of mutual assured destruction kept the Soviet Union and the United States in counterbalance, each nation recognizing that both would be annihilated if either attacked. But the old rules may no longer apply as more nations, including North Korea, have gained nuclear weapons. "We're losing our memory of the Cold War and we're losing our memory of how important it is to get this right," said co-author Tyler White, a political scientist who specializes in international security and nuclear policy. "Even a conflict that doesn't involve the United States can impact us and people around the world."

Policy analysts say some nuclear powers have adopted doctrines that allow for limited strikes and for first use of nuclear weapons. Russian defense strategy, for example, contemplates limited nuclear strikes to deter or end conventional wars.

White and Liska enlisted experts in climate modeling and climate change to assemble the report. Robert Oglesby, a professor of Earth and atmospheric sciences, specializes in climate modeling and climate change; and Eric Holley, a doctoral student in natural resources, has studied how insurance and financial incentives might be used to adapt to climate change. Using publicly available data on

1952 test test of ~10.9-megaton nuclear bomb, Enewatak Atoll, Pacific Ocean.

19 types of weapons now held by five major nuclear powers—the U.S., Russia, China, the U.K. and France—the colleagues calculated how many nuclear bombs in each category could be used before triggering conditions they describe as "nuclear autumn" or "nuclear drought." Not as severe as the nuclear winter predicted by scientists in the 1980s, a nuclear autumn nonetheless would significantly impact Earth's climate.

"The question is not if a nuclear drought can occur, but what factors increase its probability of occurring and what actions can be taken to mitigate the potentially devastating global impacts?" said Liska, who specializes in life-cycle analysis to assess the environmental impacts of products and services. Rainfall could decrease by as much as 80 percent in some areas of the world. The black ash created by a nuclear blast would cool temperatures at the Earth's surface, Oglesby said. Because there would be less temperature difference between the lower and upper atmosphere, rainfall would dwindle and cast large areas of the planet into drought.

The potential climate destruction posed by nuclear weapons is further compounded by climate change related to fossil fuel consumption, Liska added. More nations are turning to nuclear energy to reduce fossil fuel usage, which also creates opportunities for more nations to obtain nuclear weapons. Political instability as a result of people fleeing higher sea levels in the long term could exacerbate global conflict and increase the chance of limited nuclear confrontations. "We pulled together what is known about nuclear weapons today, to make a case about the magnitude of these impacts," Liska said. "With that understanding, we can make better choices going forward."

Drones Buzz Toward Increased Crop Production

Water for Food Global Institute | University of Nebraska

Research Team: (left to right) Joe Luck, Christopher Neale, Wayne Woldt, George Meyer, Derek Hereen, Yufeng Ge, (inset) Eric Frew.

A new research project funded by the USDA and the Daugherty Water for Food Global Institute seeks to deploy unmanned aircraft (drones) in search of improved crop irrigation efficiency. The half million-dollar grant will be used to explore using new aerial robotic technologies to help farmers make informed decisions about managing complex center pivot irrigation systems.

"This funding recognizes the ability of the University of Nebraska and the Daugherty Water for Food Global Institute, to lead potentially game changing research," said **Christopher Neale**, DWFI director of research and the lead project director. "We have a looming challenge to feed a growing world population expected to reach nearly 10 billion by 2050, effectively doubling the demand for food, and we need to use every tool and opportunity available to rise to this challenge."

The innovative project will allow the team to fly drones over crops at the Eastern Nebraska Research and Extension Center near Mead, and collect large volumes of data using advanced remote sensing systems and in-field sensors. Research collaborators with the University of Colorado-Boulder, Research and Engineering Center for Unmanned Vehicles (RECUV) in the Ann and H.J. Smead Aerospace Engineering Sciences Dept. are involved.

The project will conduct regular flights of unmanned aircraft equipped with multispectral and thermal infrared imaging sensors, from planting to harvest, and explore a new concept in which unmanned aircraft communicate with in-field soil water content and canopy temperature sensors.

"We will be able to economically collect near real-time crop and soil water content data, that are not currently available, and use it to create water management prescriptions for newer variable rate center pivot irrigation systems," said **Wayne Woldt**, NU-AIRE laboratory director, and BSE associate professor. With this sophisticated level of detail, farmers can respond quickly and more accurately to their soil conditions, increasing crop production while maximizing water use efficiency.

Goldfinch Solutions receives NBDC Innovation Award. Goldfinch Vice President of Research and Development Govindarajan Konda Naganathan (left), Senior Vice President Chris Calkins, NBDC Director of Technology Commercialization Wei Jing, Nebraska State Senator Kate Bolz and Goldfinch President Jeyam Subbiah.

Innovation Business of the Year

Goldfinch Solutions, a startup company, founded in 2008 by **Jeyam Subbiah**, Kenneth E. Morrison Distinguished Professor of Food Engineering, Chris Calkins, of animal science, and Ashok Samal, of computer science and engineering, has been named Nebraska Business Development Center's Innovation Business of the Year.

Goldfinch Solutions was based on research conducted at the university and is pioneering multispectral imaging technology to identify tender beef at the packing stage of production. "You can't tell the tenderness of a steak by the naked eye. With multispectral imaging, we can capture information about that steak that will identify the properties of the muscle and tell us if it's tender or not," said Calkins, Senior VP.

According to Calkins, 80 percent of all carcasses from fed cattle qualify for a USDA "Choice" or "Prime" rating, so there is not much distinction between the ratings. The imaging system allows tenderness of a rib eye steak to be certified and that guarantee applies to similar cuts from the same source. "If we can screen those cattle and provide that guarantee, we believe consumers would pay a premium for that meat," he said.

During the software development process, Goldfinch tested thousands of steaks and has a 95% accuracy rating in classifying the meat as tender. While the hardware and software are not yet on the market, the team hopes to soon get the technology into packing houses and grocery stores.

Since 2008, Goldfinch Solutions has received a total of $850,000 in funding from two Small Business Innovation Research program grants, in addition to support from the Nebraska Department of Economic Development. The NBDC is part of the College of Business Administration at UNO. The goal of the center is to help Nebraska businesses grow and create new jobs.

Company President Subbiah said, "Early on when we were trying to make tight deadlines to secure funding, NBDC really helped us navigate the grant application processes. NBDC has been pivotal to the company's progression."

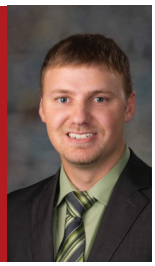
To learn more about the NBDC and the Innovation Business of the Year Award, visit https://www.unomaha.edu/nebraska-business-development-center/about/success-stories/goldfinch-solutions.php.

Goldfinch also joined with Paul Engler to form a second company, TenderSpec, to market the technology. The legendary cattleman is in the Cattle Feeders Hall of Fame, Meat Industry Hall of Fame and founded the Engler Agribusiness Entrepreneurship Program at the university.

Research Grants

Kievit Research

Dr**. Forrest Kievit**, associate professor in BSE, will be working on a joint project with UNMC. Kievit's grant, funded by the NIH funded Nanomedicine COBRE (center of biomedical research excellence) at UNMC, is entitled, *"Nanoparticle-Mediated Treatment of Traumatic Brain Injury."*



Psychology of Water Use

Daran Rudnick, BSE Assistant Professor, joins a team up of experts from Penn State University, Arizona State University and the USDA's Agricultural Research Service (ARS) to develop a model for engaging communities and stakeholders to ensure adequate supplies of quality water both for and from agriculture.

Odhiambo Awarded NIFA Grant

Lameck Odhiambo received a grant from the National Institute of Food and Agriculture for his project, "Reconfiguring Farmers' Behavior to Reduce Irrigation Water Use through Water Measurements and Social Norms Interventions: A Case Study in the Republican River Basin."

"The overall objective for this study in the Republican River basin is to better understand changes in farmers' behavior to reduce irrigation water use through provision of technical advice and social norms interventions," he said.

He noted that the majority of U.S. conservation programs rely on technologies and technical advice to reduce irrigation water use. "In fact, more efficient technology without behavioral change can actually lead to increased water use," he said.

Odhiambo's review of past studies suggested that conservation programs could achieve greater success by incorporating insights from social and behavioral sciences.

"In spite of the proven success and low cost of behavior-based conservation programs in other domains, they have not been evaluated for irrigation water conservation programs," he said. He teamed up with Dr. Kristen Olson (associate professor in sociology UNL) to test the relative effectiveness of behavior-based conservation programs versus technical advice and technology-based programs in irrigation water conservation.

NIFA Higher Education Grant

Deepak Keshwani, and other UNL faculty secured a grant from NIFA. Funded through NIFA's Higher Education Challenge (HEC) Grants Program , the Excellence in Education for Food, Energy, and Water (E2FEW) program will feature a 24 month faculty development program with the goal to enhance systems thinking competencies of UNL students. The project will support CASNR's Science Literacy Initiative.

Mark Wilkins received a SPRINT grant for the project "Development of lignin active enzyme mixture to produce sugars from lignocellulosic biomass for production of fuels, chemicals and bio-based materials." He will collaborate with Dr. Fernando Segato of the University of São Paulo.

Research Focus on the Next Generation of Agricultural Technologies *IANR News* 11/1/ 2017

"Three of the 17 agricultural technology projects recently funded by the USDA are led by Nebraska's Biological Systems Engineering Department, which is a testament to the innovative approach by our researchers," according to **David Jones**. "Through these research projects, we will be able to bring the latest engineering technology to Nebraska's biological systems."

Assistant Professor and Advanced Sensing Systems Engineer **Yufeng Ge** was awarded a three-year $499,896 grant to develop an instrumented soil penetrometer for gathering real-time and simultaneous prediction of a number of soil properties. This will be achieved through novel modeling algorithms that will relate in situ sensor data to lab-based VisNIR (visible and near infrared reflectance spectroscopy) spectral libraries. Ge is working with graduate students **Nuwan Wijewardane** and **Ujjwol Bhandari**, research technologist **Tyler Smith**, and soil scientists Christine Morgan (Texas A&M University) and Jason Ackerson (Purdue University) on the project.

Research led by **Joe Luck**, precision agriculture engineer, is focused on reducing negative impacts to society and the environment resulting from spray drift of pesticides. The four-year, $499,916 project will introduce next-generation technologies for controlling spray droplets during field applications. "As we see more interaction between rural and urban landscapes, we're going to have to do a better job of keeping 'ag applications' within respective field boundaries," said Luck. Spray drift issues were a hot topic with crop producers in Nebraska this year because of dicamba. An estimated 500,000 acres of dicamba-tolerant soybean were planted across the state, but some broadleaf crops sensitive to the herbicide were damaged due to drift. In addition to Luck, Nebraska's **Santosh Pitla** and Greg Kruger are also working on this project, along with Michael Sama from the University of Kentucky.

Advancing variable rate irrigation technology across the Great Plains and the Midwest through improved water efficiency of irrigated, row crop agriculture is the focus of a three-year, $499,978 grant awarded to **Christopher Neale** is discussed on page 7. To watch a video about this research project, visit https://youtu.be/_S1hTfel_5Y.

AFRI is America's flagship competitive grants program for foundational and translational research, education and extension projects in the food and agricultural sciences. AFRI's agriculture systems and technology grants support the design and engineering of agricultural production systems and research on the burgeoning field of biomass, biofuels, feedstock, bioenergy and bio-based products.

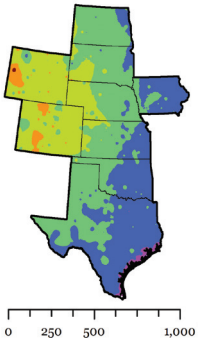
Our Faculty

Great Plains Climate Data Observed

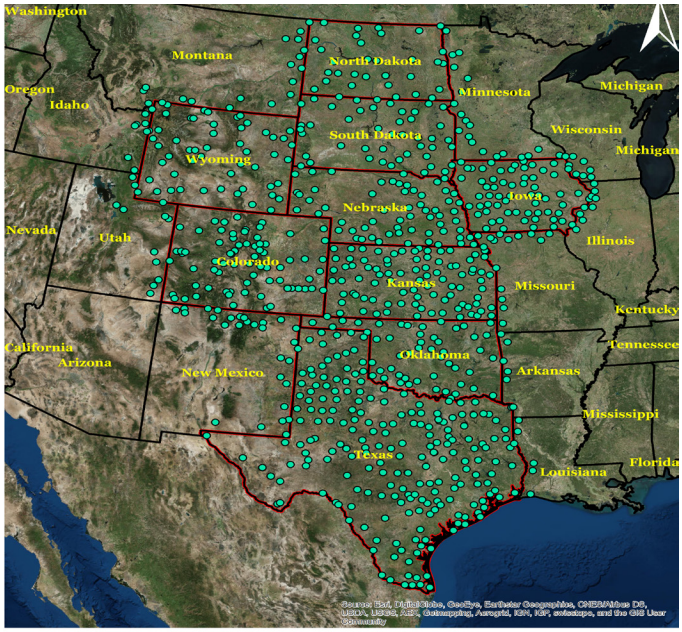
Suat Irmak and Meetpal Kukal

Suat Irmak and his Ph.D. student **Meetpal S. Kukal**, received the ASABE Educational Aids Blue Ribbon Award at the ASABE Annual International Conference on July 17, 2017 in Spokane, WA for their refereed publication titled "Observed Space and Time Changes in Air Temperatures and Daily Temperature Range for The USA Great Plains Counties from 1968 to 2013" (http://extensionpublications.unl.edu/assets/pdf/ec3009.pdf).

Their pioneering work presents scientific data, analyses, and interpretation using visual maps and discussion of: (1) geographic variability (trends) that exists in patterns of historical air temperatures (maximum, minimum, and average) and daily temperature range across the U.S. Great Plains; (2) the temporal (1968-2013) changes that have been observed in these variables; and (3) potential consequences and significance of these changes in terms of agricultural production.



The study region is comprised of nine states and 834 counties extending from Texas to North Dakota and from Iowa to Colorado, about 30% of the surface area of the continental U.S.



Study region

Weather station sites used for analyses

Educator/Researcher of the Year

Joe Luck, BSE associate professor, was named educator/researcher of the year in July by the Precision Ag Institute. The honor cited Luck's work as an educator and his publications along with his development of precision agriculture data management workshops offered through Nebraska Extension. The annual workshops focus on farm data management, teaching participants how to utilize the data to drive decisions that impact crop production. (The Precision Ag Institute was developed in 2006 as an independent global forum dedicated to the sharing of advancements.)

Luck's recent research project is called, *"Next-Generation Spray Drift Mitigation via Field-Deployable, Real-Time Weather Monitoring and Novel Spray Nozzle Control Technologies"* and is funded through the USDA NIFA program. He will be working with **Santosh Pitla**, also an assistant professor.

Extension Education Award

John Hay was selected by peers to receive the National Association of County Agricultural Agents Distinguished Service Award.

Extension Educator John Hay Mentors SMART Team to National Title

John Hay, expert in solar energy, mentored the Pius X SMART team to a National Title. The SMART Competition (www.smartcompetition.org) is a STEM and Career and Technology Education (CTE) education program that provides high school students with a practical real-world design challenge that addresses sustainability, green design, localized power generation, architecture, the environment and the community. The competition is open to all high school students who attend public, private, parochial, charter and home-based schools or participate in informal education programs. This hard working team participated in a building efficiency competition this past semester. John stated, "They won the national competition due to their hard work and dedication."

Abby Kelly (second from left) at Uluru (Ayers Rock) with CSIRO scientists and her acadenic advisor, Pat Stayton (far right)

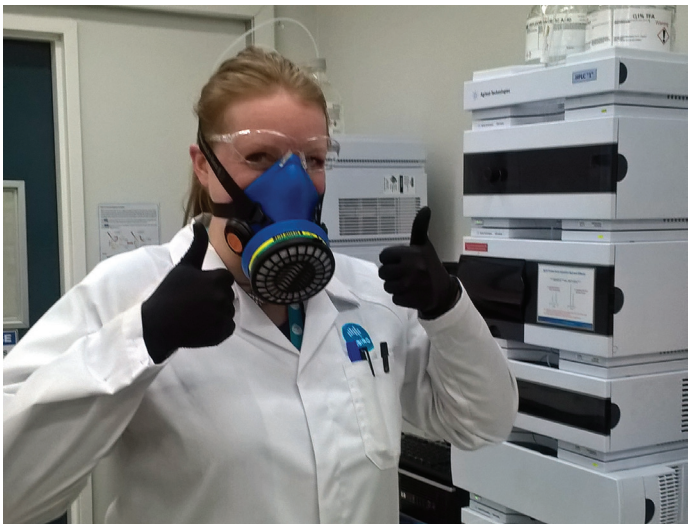
Fulbright Scholar to Australia

Abby Kelly's (BSEN B.S. 2012, M.S. 2014) Fulbright experience took her to Australia's national science lab, CSIRO (Commonwealth Scientific and Industrial Research Organization) manufacturing business unit. While the U.S. has many national labs (DOE, NIH, etc.), CSIRO conducts research all over Australia in agriculture, energy, oceans, atmosphere, minerals, nutrition, astronomy, biosecurity, and manufacturing.

Kelly creates more effective drug delivery systems for the treatment for pulmonary melioidosis, a deadly, intracellular, bacterial infection of the alveolar macrophage, endemic to northern Australia, but of immediate importance worldwide because the causative bacteria, Burkholderia pseudomalei is aerosolizable and on the CDC's list of tier 1 bioterrorism agents. Current treatment still has a recurrence rate near 20%. She hopes to develop an aerosolizable delivery system containing both an antibiotic and an antimicrobial peptide to solve multiple issues with current care. CSIRO invented a polymerization technique that allows for highly controllable polymer architectures: RAFT (Reversible addition-fragmentation chain-transfer polymerization), simple enough that non-chemists can utilize, but controllable for pharmaceutical applications.

Kelly also worked with CSIRO's "Indigenous Engagement" committee to create a quarterly outreach program for an Aboriginal community. Aboriginal school children only learn English and math. To spark their curiosity and encourage them to pursue careers in science, engagement with scientists is particularly important. As one of three scientists, she spent a week during each of their first two quarters conducting hands-on experiments with children ages 5-16, including aeronautics (paper airplanes, rockets), surface tension and shapes (bubbles), magnetism and navigation (magnets,compasses).

Kelly pursued her interest in the link between science and government, meeting with Jeffrey Bleich, special councilor to President Obama in 2009, former U.S. Ambassador to Australia



Abby Kelly in lab characterizing peptides with HPLC

2009-2013, who chairs the Fulbright Foreign Scholarship Board, and with Australian Senator Kim Carr, the shadow minister of science, who provided an AU parliament tour. Kelly was directly involved in activity to improve the relationship between Aboriginal Australians and non-aboriginals; the government is implementing multiple incentives for companies to get participate in "reconciliation" events/programs to build unity and respect. Kelly says, "Much like the U.S., Australia has a very sad history in terms of how they've treated the indigenous peoples, but unlike the U.S., the current AU government is working very hard to reconcile the past."

She reports she learned RAFT polymerization from its inventors, including numerous alternative and troubleshooting techniques, and worked directly with a peptide expert to perfect synthesis and characterization techniques. Of Australian life, she says, "Aussies are more laid-back than anyone in the world, and yet when it comes time to work, they know how to get things done. It's such a departure from the fast pace of U.S. academic life."

BIOLOGICAL SYSTEMS ENGINEERING

HALL OF FAME

John B. Solie is the 2017 Biological Systems Engineering Hall of Fame inductee A 34-year member of ASABE, he has provided leadership to Power and Machinery research, steering, and technical committees, and chaired the Oklahoma Section. He was named an ASABE Fellow in 2004 and received ASABE's "2013 Cyrus Hall McCormick Jerome Increase Case Gold Medal Award" for distinguished leadership and exceptional engineering achievements in sensor-based precision farming and design and the integration of agricultural equipment as a researcher and educator.

Solie, a regents professor emeritus and Sarkeys distinguished professor emeritus, Department of Biosystems and Agricultural Engineering, Oklahoma State University, is recognized worldwide for his work in precision farming. He has had a long and consistently productive record of conducting high-impact research, effectively sharing his knowledge and experience with students and other professionals, and serving his profession with distinction.

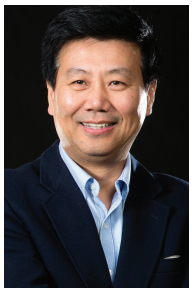
More than 21 years ago, he began providing leadership to the Oklahoma State University variable rate technology team that developed Greenseeker technology, which introduced revolutionary techniques for finding high-spatial-resolution nutrient management for crops. The team developed an optical sensor-based variable rate nitrogen fertilizer applicator to conduct the agronomic research required to define the relationships among optical measurements and plant properties related to crop yield. Their research goal was to develop a sensing and application system to determine nitrogen requirements of the crop midway through the growing season and to apply sufficient nitrogen to reach farmer yield goals.

While the results of the team's developments were controversial when initially introduced, the findings are generally accepted, with wide commercialization of the system, and research continues with particular emphasis on improving algorithms to predict nitrogen application rates. For his cutting-edge work in this area, his team was presented the prestigious USDA Secretary of Agriculture's Honor award, and he was invited to speak to the National Research Council at the National Academy of Science.

A dedicated teacher for more than 30 years, Solie has taught numerous engineering courses, and has been an undergraduate and graduate student advisor and student club advisor. It has been said that as a professor, he had a special ability to effectively address both the theoretical and practical aspects of technical subject matter. was faculty advisor for the university's ¼-Scale team for 10 years, and during this time they won the national championship two years in a row. He authored or coauthored more than 230 journal articles, conference proceedings, publications, invited presentations, and one book. His research findings have resulted in nine U.S. patents. Research contributions include reduced soil compaction from cattle grazing, improved mechanization of specialty crop harvests, and the development of the process for narrow-row seeding of wheat, which has significantly impacted wheat production and the equipment industry.

Publications

A paper that **Aaron Mittelstet** coauthored at Oklahoma State University, "Modeling Streambank Erosion on Composite Streambanks on a Watershed Scale," has been published in Transactions of the ASABE. It can be viewed at http://elibrary.asabe.org/azdez.asp?search=1&JID=3&AID=47782&CID=t2017&v=60&i=3&T=1&urlRedirect=



Yiqi Yang, Charles Bessey Professor of biological systems engineering and of textiles, merchandising and fashion design, with colleague Helan Xu, served as co-editor of the book "Porous Lightweight Composites Reinforced with Fibrous Structures." The publication offers a comprehensive overview of the raw materials, processing technologies, performance properties and applications of lightweight composites.

Alumn Honored

Alumn Dr. **Stuart O. Nelson**, of Athens, GA, was honored with the prestigious Career Excellence Award at the Institute of Electrical and Electronics Engineers (IEEE) International Instrumentation and Measurement Technology Conference in Torino, Italy, May 22-25. The award is sponsored by the Instrumentation and Measurement Society of the IEEE.

He received his B. S. and M. S. in Agricultural Engineering, and an M. A. in Physics, from UNL before joining the USDA in 1956.

Dr. Nelson worked as a Research Agricultural Engineer for the U. S. Department of Agriculture, Agricultural Research Service at the University of Nebraska, and the Russell Research Center in Athens, GA, and retired with 55 years of federal service in 2007. He is considered the father of dielectrics in food and agriculture areas and was inducted in the Biological Systems Engineering Hall of Fame in 1999.

Our Students

Our Newest Ambassador: Paulina Guzek

In our Spring 2017 issue (https://engineering.unl.edu/downloads/files/Spring%202017%20BSE%20Magazine.pdf) you met BSE Ambassadors **Jordan Bothern**, **Rebekah DeFusco**, and **Lauren Hunt**. This fall, **Paulina Guzek** joined the group. She is a a BSE senior with an emphasis in resources engineering. Guzek comes from Palos Hills, Illinois. She has been involved in the American Society of Agricultural and Biological Engineers, Engineering Student Advisory Board, National Association of Engineering Student Councils, Fountain Wars design team and Society of Women Engineers. She also works as an engineering intern for JEO Consulting Group and has studied abroad in Spain. She says she would eventually like a job that allows her to travel and put her Spanish skills to the test.

Energy Sciences Internship

From BSE Recent News

Evan Updike, a BSE junior, was selected as one of four recipients of the Darrell J. Nelson Summer Undergraduate Internship in Energy Sciences Research for the summer of 2017. **Adam Liska** sponsored Updike's application and his work experience this summer. At the end of the paid internship, each student prepares a summary report that describes the accomplishments or results of their work experience in energy sciences research.

The internship is in its fourth year, named after Darrell J. Nelson, who served 41 years on the Custer County Public Power District and Nebraska Public Power (NPPD) Boards. In 2005, Nelson proposed a partnership between NPPD and UNL for the purpose of engaging in energy sciences research. The following year, the Nebraska Center for Energy Sciences Research (NCESR) was created with NPPD's support.

Research Fair Honor

Brett Whorley, BSEN junior, received a $250 award for the undergraduate poster at the 2017 Spring Research Fair Chase Pfeifer. More than 200 undergraduate research posters, 10 undergraduate creative exhibits and 160+ graduate research posters and exhibits were featured on April 4-5 in the Nebraska Union. Over 400 students participated.Whorely's poster was "Improving Ankle Kinematics on Madonna Pedi-ICARE."

1st Place Water for Food Conference

Naisargi Nitinkumar Dave, master's graduate student in BSE working with **Aaron Mittelstet**, earned first place in the 2017 Water for Food Conference Graduate Student Online Poster Competition. She has received complimentary registration as well as a $1,000 prize.

Franco's List

Josiah Johnson, BSE sophomore, was named to Franco's List in April. Franco's List—named after Juan Franco, the university's vice chancellor for student affairs—recognizes students at Nebraska who demonstrate characteristics essential to being a person of integrity. Awardees represent six building blocks of character: caring, citizenship, commitment, dependability, open-mindedness and respect. Nominees are are selected by peers on the vice chancellor for student affairs' Character Council.

UCARE Recipients

Four BSE students were given support to work with faculty mentors in research or creative activities in UNL's Undergraduate Creative Activities and Research Experience (UCARE) program. The students receive stipends of $2,400 for working 20 hours per week.

Janelle Adams "Characterization of Various Hydrogels Utilized for Single Walled Carbon Nanotube Sensor Delivery Platforms"
Phu Nguyen "Exploring the Mechanical Effects of Cardiac Fibrosis"
Merrett Lane "Micro-Hydropower Generation Along the Platte River"
Joseph Stapleton "Characterization of Various Hydrogels Utilized for Single Walled Carbon Nanotube Sensor Delivery Platforms"

Design Challenge Helps Medical Technicians

From BSE Recent News

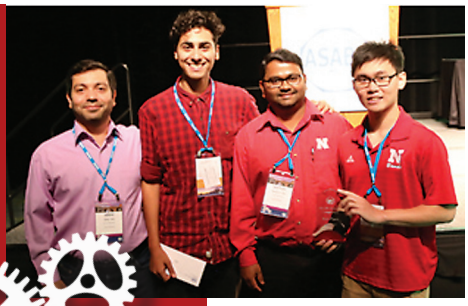
Helping the Veterans Affairs (VA) Nebraska-Western Iowa Health Care System in Omaha find a better way to assist patients off of an X-ray table was a challenge for a team of biological systems engineering students.

Kristina Zvolanek, **Merrill Brady**, **Yuki Naoe,** and **Doug Rowen** addressed design constraints such as the small size of X-ray rooms, lack of budget, injuries to technicians assisting patients. The team used computer software to design Pivot Panel to solve the problem. The device attaches to the table. A patient rolls on to his/her right side and grasps a handle with the right hand. The panel then lifts the patient into a sitting position and rotates him/her to the edge of the table.

"We experienced so much as a team," Zvolanek said. "This is so abstract for us because we don't have prototypes to test. We just have to use our best guess as to whether it would work . . . and also, sometimes what your client tells you is the problem may not really be the problem. At first we had to get the patient from laying down to sitting up. But that's not the only issue. We had to consider the health of the technicians. Those surprises are things we're going to face in our careers after graduation."

BSE Teams Place in Top 3

Robotics Team 2nd



Huskerbots, the UNL robotics team led by **Santosh Pitla** and **Yufeng Ge**, placed second at the ASABE international competition in Spokane in July. Students on the team **Abbas Atefi, Cheetown Liew, Piyush Pandey, Lukas Renker, Hesan Sedaghat, and Jenny Wynn** competed against 18 other teams. .

In the Robotics Student Design Competition, undergraduate and graduate students build a robot or group of robots to carry out an agricultural task. The robots must be fully autonomous and able to complete the task without human intervention. The task involved mechanical design, software code development, sensor instrumentation, and machine vision.

"The task for this year's challenge was a difficult one in comparison to challenges from the past few years," Pitla said. "The team worked really hard throughout the year and went through ups and downs during the design and testing process. . . . Integrating all these facets of the robot and going from concept stage to development, testing and evaluation were some of the very important tasks students accomplished during this experience. We hope to develop a university-wide student robotics team in the coming years as the competition demands interdisciplinary skills involving the understanding of agriculture, mechanical design, electronics, software programming, sensing, and wireless communication."

More information on the competition can be found here: https://www.asabe.org/awards-landmarks/student-awards,-competitions-scholarships/robotics-competition.aspx

Front, l to r: John Evans, John Freudenburg, Olivia Bures, Jared Bowker, Kyle Christensen, Josh Murman, Caleb Lindhorst, Josh King, Nick Engle, Seth Wetovick, Keith Kopcho, Roger Hoy. Back: Noah Bolin, Zak Kurkowski, Jonah Bolin, Colton Rathman, Jason Shultis, Austin Jeffrey, Devon Vancura

Quarter Scale Team 3rd and 1st

On behalf of team advisors Drs. **Joe Luck** and **Roger Hoy**, Luck said, "I'm happy to report (once again) some outstanding results in the 2017 Quarter Scale Team competition." The A-Team finished 3rd overall in a very tight competition behind Purdue and South Dakota State. They won the Test & Development award this year and came in 3rd in the team presentations. This is an excellent follow up season to last year and our captains (juniors this year) will be returning for 2018 as seniors to lead the team. Over 25 teams competed in the 2017 international competition (and teams from Canada and Israel were represented).

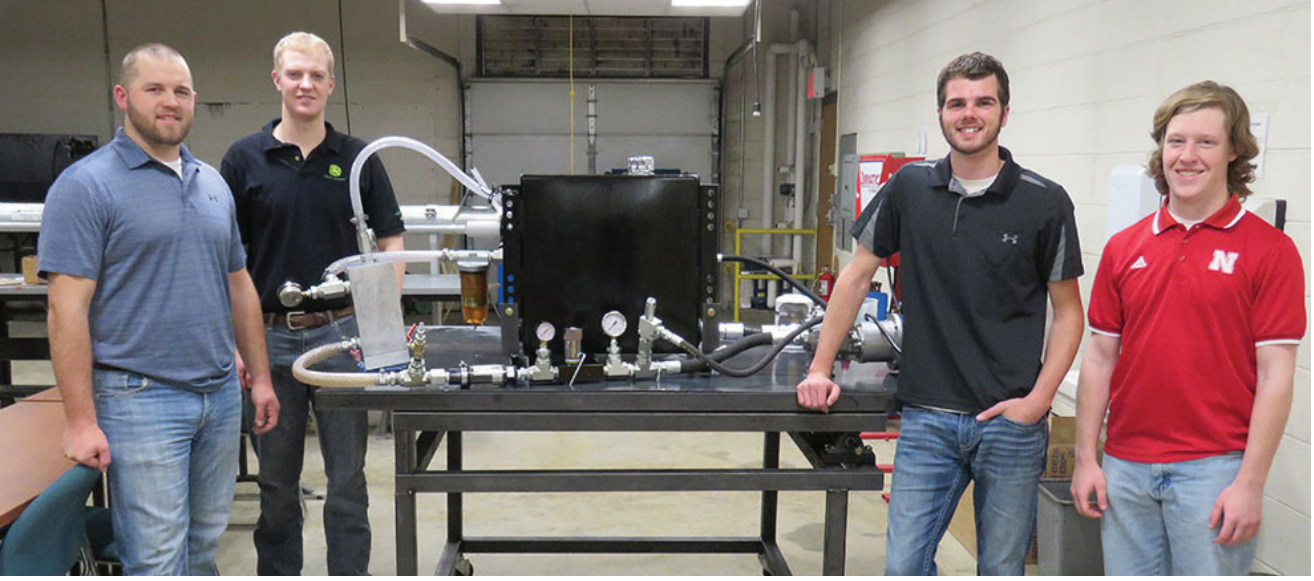
The X-Team took 1st place overall! They were 1st place overall in written report and oral presentation among eight teams. They placed in the top three teams in the performance pulling competition.

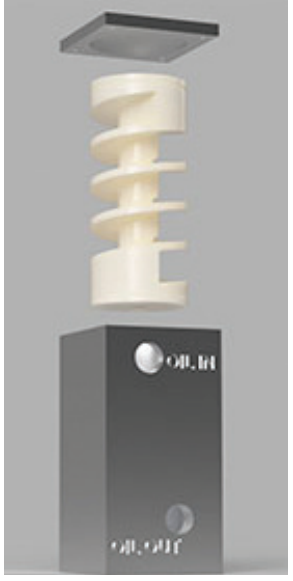
We had 17 students who represented the University admirably (probably the largest team there) and helped others with parts and repairs.

Fountain Wars 2nd

The UNL Fountain Wars Team took 2nd place in Spokane at the 2017 ASABE Annual International Meeting in July. This team has placed in the top two each year for the past four years. Fountain Wars is a hands-on competition in which a team of up to six students design a fountain to complete challenges using the necessary PVC pipes, couplers, fittings, valves, nozzles, and pumps. The technical tasks this year included "Catch and Release," where students had to catch a ball with a fishing net, and "Scrambled Eggs," where an egg had to be moved along a circuit without breaking it. **Derek Heeren** is the advisor.

From left: Ben Everswick, Jeff Ostermiller, Paulina Guzek, and Doug Rowen (captain).





Luke Johnson, John Nielsen, Aaron Steckly and Bennett Turner. Right: The device they developed.

Capstone Student Team Helps John Deere

Apr 17, 2017 By Karl Vogel *Nebraska Engineering News*

A team of biological systems engineering students is taking inspiration from race-car engines to help John Deere prevent air bubbles from damaging an oil filter in of one of its tractors. As part of their senior design capstone project, the team of **Luke Johnson**, John Nielsen, **Aaron Steckly** and **Bennett Turner** used 3-D printing to create a corkscrew-like device that uses centrifugal motion to remove air from the hydraulics and return clean oil through the system.

John Deere wanted filtered clean oil coming from the transmission back to the clean-oil reservoir. Johnson said, "Out of that pump they were having that cavitation problem. There was air entrained in the oil and it was going through, and impact loading that filter. When the air slams into the filer, it destroys the paper element inside. Our device increases the life of their filter."

Early in the fall semester, the team was using centrifugal force to separate the fluids, Turner said, "We knew the constraints —it couldn't be too big, it had to work at a certain incline, and wouldn't use electricity to power it. In the end, it was the most practical thing we could apply."

Johnson said it was the first step in bringing together the knowledge they had learned in their college classes with their experience from other areas. "We kind of knew we wanted to do it this way because, when you have two fluids with different densities, you can separate them if you spin them."

The device consists of a box into which tubes for intake and output are attached. The intake tube brings the "dirty" (mixed oil and air) fluid mixture into the top of the box, where it feeds into the 9-inch long, corkscrew device. The denser oil circulates around the outside of the spiral and into the output tube. The lighter air is sent up through a center tube and out of the box.

Because all existing devices were much smaller in scale, the capstone team had to scale-up to meet the size demands of the John Deere tractor.

They found success on a smaller-scale version of their device, using low flow rates and a similar but smaller centrifugal device used in race-car engines.

Using calculation techniques learned in fluid dynamics classes, the team realized the centrifuge had be larger. We scaled up the diameter of the new hole, the intake, and based on that, we knew that we could increase the flow and it should work," Steckly said. "We noticed that when we'd go up to higher flow rates, like the ones in the tractors, it wasn't nearly as effective."

Working with a larger-than-usual budget for a senior capstone project—John Deere gave the team about $12,000—keeping costs down was always a factor, Nielsen said, "The budget we had to work with gave us a lot of freedom, but we have always been very cost-conscious."

Choosing to manufacture the part on a 3-D printer was the logical choice. Not only would they save hundreds of dollars, the team also could rely on Nielsen's experience in that field.

"I have an internship and that's my job – to design and 3-D print things," Nielsen said. "This part was a much larger scale than anything I've ever printed. It took close to 40 hours to print and we had to use my company's printer because it has a 1-cubic foot volume."

When the larger-scale device was assembled and tested, it was easy to see that the decision to scale up was the right one. "It's one thing to conceptualize it and design it and see pictures of how it's supposed to be," Johnson said. "but knowing that it works, that's pretty awesome."

The experience of working for a real client and developing a real product is something the team members value. "It definitely gives us an edge, putting us in a real-world scenario; we're working on a project that has deadlines, and we have to meet them," Johnson said. "We have to complete the whole engineering process on one part, and that's something we hadn't experienced before."

https://engineering.unl.edu/team-bse-capstone-students-helps-john-deere-take-air-out-hydraulics-problem/

Tractor Restoration Club members (from left) Kiel Kruse, Joshua Bauer and Jaythan Scheideler work with support pieces that will be attached to the 1945 Allis Chalmers Model C so it can be moved around for restoration work.

Craig Chandler | University Communication

Tractor Restoration Club Preserves Tractor Used on Nation's Final Homestead

Adapted from Leslie Reed | University Communication

For the Tractor Restoration Club students, fixing up tractors from their great-grandparents' era is a key part of college life. Created in 2005, the club typically restores two or three tractors a year, in the shop at Larsen Tractor Test & Power Museum, which are displayed or sold for museum benefit. They have an unusual challenge: to prepare a 1945 Allis Chalmers Model C for display at the Homestead National Monument near Beatrice. The model is far from rare—about 84,000 were manufactured at the company's Wisconsin plant—but this specific tractor has a special story. It was lifted by helicopter in June from a roadless site in Alaska, the last land in America to be claimed under the federal Homestead Act of 1862. Homesteader Ken Deardorff, a Vietnam War Veteran, used it to clear hundreds of tree stumps to farm the land as required by the homesteading law. Members met Oct. 12 with Al Levitan, a conservator from West Virginia who is consulting for Homestead, to discuss how to recover and prepare it for permanent display. (Retired Beatrice physician C.T. conservation project.) The goal with this rusty, lichen-encrusted machine will be to stop its deterioration so it can survive as a testament to one homesteader's grit.

Club president **Joshua Bauer** said he was in disbelief when he first saw the tractor after it was delivered, "It was incredible to go all the way to Alaska to get that one tractor. Now it's actually here and it's my responsibility. We'll never get to do something like this ever again. It's truly a once-in-a-lifetime experience." Mark Engler, superintendent at Homestead National Monument of America, said the tractor is an "American treasure."

Milford Hanna, BSE emeriti and the group's adviser said, "It's a change of pace for the students and lots of practical aspects, though not many are going to end up in the tractor restoration business. They come from all different backgrounds, from all across the university. And they are always working on tractors. That's what it's all about." The club reflects the university's history and mission in ag Frerichs provided financial support to the Friends of Homestead for the ricultural education, particularly the nationally recognized tractor test laboratory and the Larsen Museum. But it also fits more recent emphasis on "maker" activities, where students learn creative ways to solve problems by mastering skills like welding and engine repair. Doug Koozer, a tractor restoration expert from Cheney, has been in the antique tractor business for 30 years and voluntarily advised the club for many years. He said the project provides students a deeper perspective on their restoration efforts. On Nov. 20, Homestead plans a public viewing event when the tractor is installed in the museum there.

Livestock & Poultry Awards

SCHMIDT LAB

Livestock & Environment Research

Linda Schott, Amy Schmidt, Erin Stevens.

Erin Stevens (M.S. Animal Science) was awarded first place in the graduate student poster competition at the Livestock and Poultry Environmental Learning Center Waste-to-Worth National Conference held in Raleigh, NC, April 18-21. Erin's poster was titled, "Manure Treatment and Natural Inactivation of Porcine Epidemic Diarrhea Virus in Soil." She received a $500 award.

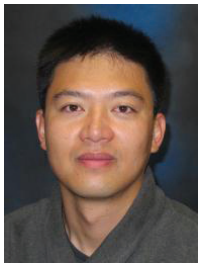
Linda Schott (Ph.D. in BSE) was awarded third place in the graduate student poster competition at the Livestock and Poultry Environmental Learning Center Waste-to-Worth National Conference held in Raleigh, NC, April 18-21. Her poster was titled, "Utilization of Woody Biomass and Manure as Agricultural Soil Amendments in Nebraska." She received a $100 award. Schott was also awarded a 2017 College of Engineering Graduate Student Conference Travel Grant to attend the conference. And she received a 2017-18 Milton Mohr Graduate Fellowship from the College of Engineering in the amount of $1,000 ($500 per semester).

Linda Schott was selected to participate in the "Preparing Future Faculty Program" offered by the Office of Sponsored Programs. The program is a professional development opportunity for advanced doctoral students interested in pursuing a faculty position. Participants learn about faculty roles and responsibilities (research/scholarship, teaching, service) and are better prepared for the academic job search and more successful in their first faculty position.

Coming & Going

David Jones, associate dean of engineering, was appointed the interim head of the department beginning July 1. Jones has served as an associate dean since August 2011. He is also a professor of biological systems engineering and a courtesy professor of food science and technology.

Mark Riley is now the Associate Dean for Research at the College of Engineering. His position began July 1, 2017. Riley has a distinguished record as a faculty member and has a very successful five year term as the Head of the Department of Biological Systems Engineering.



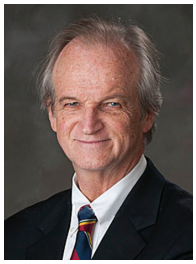
Dr. **Xin Qiao** started as an Assistant Professor at the Panhandle Research & Extension Center in Scottsbluff in May. He received his B.S. at South China University of Technology in Water and Wastewater Engineering (2009), and his M.S. and Ph.D. (2015) degrees in Agricultural and Environmental Engineering at Clemson University. Xin was team leader for the 2015 ASABE robotics competition team.

Dustin Dam left his position as BSE's Engineering Systems Integration Specialist in Oct. to operate his company, Dam Integration and Technology, full time, focusing on automated test and measurement and custom instrumentation applications. He plans to stay in Lincoln, and anyone who would like to keep in touch can reach him at dustin.dam@dam-tech.com.

Tracy Zimmerman began Aug 28, as Administrative Associate. She has a long history of service at the Nebraska Department of Environmental Quality. Most recently, she worked with David Jones in the College of Engineering Dean's office.

Shannon Parry left BSE in July for a new role as project associate in graduate programs in the UNL Department of Teaching, Learning, and Teacher Education. She started with us in September of last year, assistingthe Department Head, helping to streamline programs and promote BSE. Her efforts were much appreciated.

Retiring



After more than 45 years of international work in water management and sustainable agriculture, **Roberto Lenton**, BSE professor retired Sep. 30th.

Lento founded and served as the director of the Robert B. Daugherty Water for Food Institute at the University of Nebraska, growing the institute from an idea to a fully operational research center. Before coming to the university, he chaired the World Bank's Inspection Panel, headed the environmental division of the United Nations Development Program, served as senior adviser at Columbia University's Earth Institute, and worked with the Ford Foundation in India. In his last colloquium lecture, he shared lessons learned from starting global water institutions in Sri Lanka, Stockholm, and Lincoln, Nebraska. Lento is indubitably one of the world's foremost experts in water resources and sustainable development.

Diann Young began her retirement Oct. 1 from her position as Administrative Support Associate. She began at BSE in 2005. She received the IANR Outstanding Employee Award; UNL Parents Association/Teaching Council Certificate of Recognition for Contribution to Students in 2008 and was awarded the eSAB Student Chapter Staff of the Year award in May, an amazing achievement for an amazing person!

Brent Sampson started at the Nebraska Tractor Test Lab in 1976 and has been involved in 45% of all the tractors that have ever been tested. His retirement reception was June 30. When Sampson graduated from Iowa State University with a degree in mechanical engineering, he wasn't looking for a career in tractor testing, but said he was interested in finding out where the fancy reports came from, "You could get test reports on your tractor from the lab and I thought that was good." He got reports on his family's tractors and decided to go see the facility for himself. "They had a building over there that's like 70 years old, but that didn't deter me," says Sampson. He sent in an application and waited. There weren't any openings, so he spent four years working on a grain drying project, then was offered the opportunity to move to the lab in 1976, moving to the new building in 1980. Sampson worked on many different tests throughout his career, including the PTO test, drawbar test, sound levels, hydraulic flow and three-point hitch. His most recent work has been on the drawbar tests and sound levels out on the track. His work has taken him to Switzerland, Japan, Czech Republic, Finland, Spain, Italy, Egypt, Turkey and across the U.S. for meetings. Sampson says his favorite part is receiving reports from other stations around the world and being connected with all of the tractor data that's available. He also says the tractors just keep getting bigger, fancier and a lot more electronics than they had early on. After his retirement, Sampson plans to come back and work on special projects. "This has been sort of my ongoing hobby," he says. "There's that saying out there that if you find something you like to do, you'll never work a day in your life and that's kind of what I've been doing."

SCHOLARSHIPS

AGP Biological Systems Engineering Student	Kolby Griger Loren Steinman
T-L Irrigation, Leroy W. & Jeane E. Thom	Kelsey Bohling Jordan Bothern Jared Donoghue Isaac Frerichs Mark Freyhoff Brendan Meyer Anthony Muesch Joshua Murman Seth Schumacher Seth Wetovick
John Deere	Noah Bolin Olivia Bures Sydney D'Huyvetter Rylan Dvorak Nicholas Engle
Dr. & Mrs. William E. Splinter	Rebekah DeFusco
Wayne E. & Virginia R. Thurman	Junior Hilker Travis Linnemeyer Devon Vancura
Elenore Gakemeier Swarts Distinguished	Janelle Adams Paulina Guzek Lauren Hunt Andrew Minarik Brett Whorley
Orve & Scott Hedden Memorial	Kevin Sousek
Glen D. Chambers	Megan Pamperin
Warren P. Person Memorial	Jonah Bolin Zoie McFarland
Fred R. Nohavec	Fatimatul Zenou Amadou
Dirk & Janice Petersen	Alli Hauger
Ken Von Bargen Student Support	Joel Scott
Edgar Rogers Memorial	Benjamin Barelman Parker Wallin
George Milo Peterson	Jacob Hermance
Ivan D. Wood Memorial	Ian Fuchtman Isaac Hanson Josh King
Case New Holland	Court Kaelin Zak Kurkowski Connor Merrill
John Sulek Memorial	Jeremy Sousek
Paul E. & Mary Beth Fischbach & Family	Jacob Schlick
Glenn J. & Maria L. Hoffman	Josiah Johnson
Mr. & Mrs. W. F. Hoppe, Sr. Memorial	Noah Johnson
Leonard G. Schoenleber	Hunter Miller
Jack Schinstock	William Lammers
Lloyd W. & Margaret V. Hurlbut Memorial	Joshua Powers
Tom Thompson Memorial	Nick Jarecki
Leslie & Harriet Jochens	Noah Bolin Olivia Bures SydneyD'Huyvetter Rylan Dvorak Nicholas Engle Jennifer Wynn
Central Plains Irrigation Association	Roy Adams
Lou Leviticus Memorial	Zak Kurkowski

GRADUATION

Spring 2017

AGEN
Jeffrey Ostermiller
Austin Hines
Aaron Steckly
Kyle Olson

BSEN
Freshta Baher
Emily Bender
Hannah Blagburn
Merrill Brady
Michael Brady
Bryan Brunson
David Calin
Marvin Cunningham
Katherine Dudley
Samuel Hansen
Kari Heck
Erica Hedrick
Sarah Heindl
Austin Helmink
Bailey Helmink
Clayton Kachek
Courtney Kinser
David Lillyman
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