THE LINK

LINKING INNOVATION AND NEW KNOWLEDGE

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SEATON 142 RENOVATION

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KANSAS STATE UNIVERSITY

College of Engineering
Department of Biological and Agricultural Engineering

THE LINK

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THE DEPARTMENT OF BIOLOGICAL AND AGRICULTURAL ENGINEERING 2016 FACULTY

Joseph P. Harner, professor and head

Jonathan Aguilar, assistant professor

Edwin L. Brokesh, instructor

Gary A. Clark, sr. associate dean, COE

Daniel K. Flippo, assistant professor

Mei He, assistant professor

Stacy L. Hutchinson, professor

Isaya Kisekka, assistant professor

Zifei Liu, assistant professor

Ronaldo G. Maghirang, professor

Trisha L. Moore, assistant professor

Danny H. Rogers, professor

Vahid Rahmani, assistant professor

Ajay Sharda, assistant professor

Aleksey Sheshukov, assistant professor

John W. Slocombe, professor

Susan Sun, ancillary faculty

Donghai Wang, professor

Lisa R. Wilken, assistant professor

Naiqian Zhang, professor

FROM THE DEPARTMENT HEAD

FROM SEATON HALL 129 — MOVING FORWARD

The 2016 issue of The LINK — our second edition — provides alumni and friends a linkage to happenings in the department of biological and agricultural engineering (BAE).

U.S. Rep. Paul Ryan stated, "Every successful individual knows that his or her achievement depends on a community of persons working together." The "tradition of excellence" of BAE is directly linked to a community of people working together. Department accomplishments, recognitions and accolades result from faculty, office professionals and students working together. I believe more than 25 times during the past year, BAE was mentioned in the K-State Today daily newsletter.

However, our alumni and friends are a vital component of the departmental success. Your investment of time, finances and service are significant in helping the department continue its "tradition of excellence." Alumni support enables faculty and students to participate in international exchange programs, supported undergraduate research innovation and design teams. It allows undergraduate and graduate students to experience participation in an international professional society meeting, as well as a variety of other educational enhancement and development activities. Thank you for all you do to support the department and for investing in the BAE team.

Henry Ford stated, "If everyone is moving forward together, then success takes care of itself." I am thankful to be part of a community where people are working together and moving forward toward accomplishing K-State Vision 2025.

"We're working together; that's the secret," according to Sam Walton. Obtaining and reaching the goals outlined in Vision 2025 is now less than 10 years away. However, working together and recognizing that a goal is accomplished through many small steps is important. Everyone's involvement will be key in reaching the BAE goals outlined in our Vision 2025 plan.

We hope you enjoy reading about our 2016 highlights in The LINK. A glimpse of faculty and students' activities and experiences are featured throughout. Remember the unseen "small step" behind each accomplishment touted involved finances, time and connections contributed by our alumni and friends. Thank you.

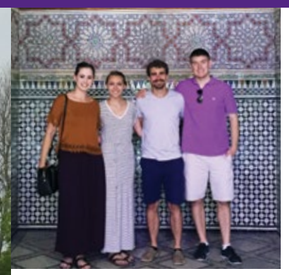
Joseph P. Harner III
Professor and Department Head
Biological and Agricultural Engineering

STUDY ABROAD — SPRING 2016 SEMESTER

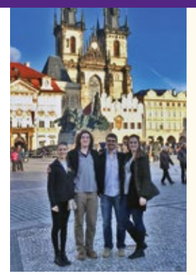
CZECH REPUBLIC

In February, five BAE students from K-State boarded a plane headed for the Czech Republic. Immediately after landing, Czech buddies — local students willing to assist in the transition to international life — met the K-Staters and took them to their new home for the next four months. The first weeks were a whirlwind, as the incredulity of living halfway around the world became a reality.

As quickly as Prague became a new place to call home, it ended just as fast. Soon it was July and the semester has ended. The memories created, though, will remain forever. Prague was the perfect place to study: the people were friendly, the city was gorgeous (and also cheap), and it offered a central location to travel throughout Europe, and even into Africa. Students formed friendships from all over the world, while experiencing incredible events and activities.



Throughout the semester, the students had a chance to grow together, taking many of the same classes, as well as traveling together. Now that the semester has come to a close, four of the group looked back on what was important to them, sharing some of their best experiences in the following testimonials:



"My favorite thing about Prague was definitely Old Town. The main square is absolutely gorgeous and there's also a lot of fun things to do in that area. It was definitely hard to walk through Old Town one last time before I left the Czech Republic."

— Chelsea Fleming

" One of my favorite spots in Prague is the Charles Bridge. This is a walking-only bridge with numerous saints' statues lining the walkway. Walking over the bridge always gave me a sense of what it might have been like to live in Prague in medieval times, and there is a gorgeous view of a castle, which is not far away."

— Anna Brokesh

" It is impossible to relay the depth of my joy and gratefulness for having had the chance to study abroad. The fact that K-State, professors, alumni and parents are so supportive and encouraging of this opportunity is amazing. My time abroad has taught me a lot, helped me grow and given me experiences I will never forget."

— Craig Griswold

" My favorite trip our group took was to Vienna, Austria. The amount of culture, architecture and beauty we saw in such a short time was unimaginable to me. We were able to experience some of their small joys such as their delicious gelato, or their butterfly gardens, as well as their unsurmountable palaces. Fortunately, we were able to walk through the Schönbrunn Palace and learn all about the life and history of those who have/had lived in the palace. Overall, it was an eye-opening, life-changing event for me. The entire experience would not have had such an impact without this trip."

— Kyle Lickteig

LEFT: FROM LEFT, MATT (A K-STATE MECHANICAL ENGINEERING STUDENT), ANNA, KYLE AND CHELSEA IN THE GARDENS OF SCHÖNBRUNN PALACE IN VIENNA, AUSTRIA
TOP LEFT: FROM LEFT, CHELSEA, ANNA, CRAIG AND AARON IN BAHIA PALACE IN MARRAKECH, MOROCCO
TOP RIGHT: FROM LEFT, ANNA, KYLE, CRAIG AND CHELSEA IN OLD TOWN, PRAGUE
RIGHT: FROM LEFT, FRONT, CHELSEA, ANNA, AND JENNIFER VOGT (A K-STATE STUDENT WHO WAS STUDYING IN FRANCE); FROM LEFT, BACK, CRAIG AND KYLE ON A PADDLE BOAT IN MUNICH, GERMANY

Believing that international travel and cultural exchange are important to students getting a well-rounded education, Harry and Elaine Manges established the Harry and Elaine Manges Family International Scholarship for students in the department of biological and agricultural engineering in the College of Engineering at Kansas State University.

Throughout his career, Harry has been invited to lecture in Europe and South America. He and Elaine have visited Mexico several times with Heifer International, working to end hunger and poverty through agriculture. It was these experiences that sparked their interest in a scholarship to support students studying abroad.

"I think it's great for young people to get out and see the world," Harry said. "This scholarship will give students the opportunity to experience other countries and cultures."

BAE's study abroad students Aaron Akin, Anna Brokesh, Chelsea Fleming, Craig Griswold and Kyle Lickteig wish to thank the Mangeses for their continued generosity and all the Harry and Elaine Manges Family International Scholarship has provided them. The scholarship has and will give other BAE students the opportunity to study abroad, and gain wonderful experiences and memories to cherish throughout their lives.

BAE STUDENTS EARN TOP HONORS AT LOW-IMPACT DEVELOPMENT DESIGN COMPETITION

Three biological and agricultural engineering graduate students – Kelsey McDonough, Kari Bigham and Erica Schmitz – were awarded top honors at the 2016 Great Plains Low-Impact Development Student Design Competition held in Omaha, Nebraska, in March.

The competition tasked students with developing a comprehensive stormwater design that would address flooding and stormwater quality in Omaha's Gifford Park neighborhood, while also providing ecological and recreational amenities to the community and park visitors. The team produced a written report and then presented their design concept to representatives from the city of Omaha as well as other industry and academic judges during the competition.

In addition to giving these BAE students the opportunity to apply their engineering design skills, the competition also provided a venue to work as part of an interdisciplinary team with Kansas State landscape architecture students Conner Bruns and Jonathan Knight. After developing their design, which included low-impact development elements such as bioretention and permeable pavement, the BAE team conducted an in-depth economic and hydrologic modeling analysis to predict flood retention and water quality benefits of their design. Their landscape architecture collaborators helped in developing creative planning layouts and engaging visualizations to market their design to competition judges. Despite a short timeline and challenges that come with interdisciplinary team work, the students' complimentary skill sets and unified vision paid off – in addition to a cash prize, the team had the satisfaction of producing a design that integrated both ecological and social benefits for a community in need.

Stacy Hutchinson and Trisha Moore, both BAE faculty, served as faculty mentors to the team alongside Lee Skabelund, professor of landscape architecture.

KELSEY MCDONOUGH, BAE, REPRESENTING THE KANSAS STATE TEAM AT THE DESIGN COMPETITION IN OMAHA, WITH STEVE RODIE, UNIVERSITY OF NEBRASKA-OMAHA, WHO ORGANIZED THE CONFERENCE.

A STUDENT TEAM OF KANSAS STATE BAE AND LANDSCAPE ARCHITECTURE STUDENTS DEVELOPED A STORMWATER MANAGEMENT PLAN FOR A COMMUNITY IN OMAHA, NEBRASKA, THAT MEETS BOTH ECOLOGICAL AND SOCIAL GOALS.

WINDBREAK FOR CONTROL OF AIR POLLUTANTS

JONATHAN ZELLER, BAE RESEARCH TECHNICIAN, MOVES TREES TO SET UP VEBS USING A TREE SPADE PROVIDED BY THE USDA PLANT MATERIALS CENTER.

Emissions of dust, odor and other air pollutants from livestock facilities are receiving increasing concerns related to nuisance, health and upcoming air quality regulations. Windbreak is a potential cost-effective strategy for reducing multiple air pollutants. It can function as a living bio-filter, so it is sometimes also called a vegetative environmental buffer, or VEB.

Design of VEBs should consider air circulation near and through animal houses, and effectiveness of VEBs is highly dependent on proper design. A recent survey in Iowa showed that 75% of swine producers are interested in using VEBs for odor management. However, lack of information on performance and technical guidelines have been barriers to their adoption and use.

Funded by the National Pork Board, a BAE air quality group established VEBs using red cedar trees at the K-State research swine facilities. They examined their performance under various conditions, as well as the effects of key design parameters such as height and thickness. Results of the project had been presented in the 2015 ASABE annual meeting. The research group's ultimate goal is to develop technical guidelines for VEBs in order to maximize effectiveness of air pollution control with limited costs.

SEATON 142 RENOVATION

"Life is a series of steps. Things are done gradually. Once in a while there is a giant step, but most of the time we are taking small, seemingly insignificant steps on the stairway of life."

—Ralph Ransom

In November 2013 some BAE faculty were challenged to develop a vision for transforming Seaton 142 into a 21st century academic teaching, research and outreach center. The goal was to look futuristic, enhance the learning environment, and create innovative teaching and research areas. The foundation was provided by considering how Seaton 142 was utilized by past teaching, research and extension activities. The focus was on remembering the past but focusing on the future.

Many seemly insignificant conversations and ideas followed with faculty, students, advisory boards, administration and allied industry during the following months. An early outcome was STORM 2050 (sustainable terrain and off-road machinery), and this became the theme with a focus on food, fiber and fuel machinery systems in 2050. A conceptual idea was developed for renovating the space in 2014 and seemly more insignificant conversations followed, but the vision remained.

The hiring of an architecture firm to bring the ideas together within the space and funds available was a major step in 2015. Progress continued as we received approval of the architectural plans by the state architect and then opening of the construction bids. For every two steps of progress there seemed to be one step of regress. After many "small, seemly insignificant steps" forward and backwards during the past two and one-half years, we relished the "giant step" as the renovation was completed in August 2016.

We invite you to stop by and see Seaton 142 and how we transformed the ag engineering machine shop into a 21st century academic learning center with a goal of promoting excellence and innovation in machinery systems. Additional enhancements identified as part of the original vision will be incorporated as funding becomes available. These include naming of research bays and a research development lab, display cases in the "walk of fame" and educational displays. In the meantime, thanks to everyone involved in helping us persevere through the seemly insignificant steps to enjoying the giant step of the new academic learning center for machinery systems.

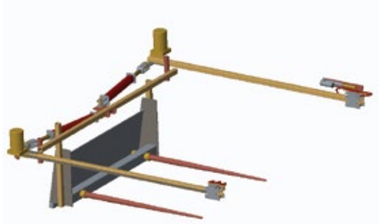
AWARD-WINNING BAE SENIOR DESIGN TEAM

The line solutions senior design project team continued the BAE tradition of innovative design work and award-winning performance by winning two awards in summer 2016: the Kansas State University Kirmser Research award; and third place in the AGCO National Student Design competition at the ASABE-AIM meeting for their design of a device to mechanically remove net wrap from large round bales.

Their success started in the late summer of 2015 when a design team of Austin Schmitz, Peter Masters and David Leiszler developed their own project idea for senior design. The students wanted to develop a device to remove net wrap from large round bales from the operator's station of a tractor or loader. A requirement of the class is that all design teams have to have a client to work with. The team contacted Kerri Ebert with the Kansas AgrAbility program, who connected them with Neal Gugler, a disabled farmer, and provided some developmental funding for the project. The team developed a device that will allow Gugler to quickly and safely remove net wrap from the large round bales from the seat of a skid steer loader. In addition to winning awards, the design team is pursuing a patent for its idea.

The team researched existing solutions, developed conceptual solutions, and modeled, built and tested potential machines for net wrap removal. The final design included a hydraulically powered swing arm, electric winch motors to move trolley, a cutting mechanism and electric linear actuator.

Course instructor, Ed Brokesh, indicated the quality of this project was a direct result of the amount of research work the team invested. The group used library databases and links extensively to locate information on existing and past products, patents, peer-reviewed journal publications, and ASABE and SAE safety standards. They also spent time interviewing and watching their customer work to understand the individual's need and limitations.



CAD MODEL OF A MECHANICAL LARGE, ROUND BALE, NET WRAP-REMOVING DEVICE

KIRMSER AWARD WINNERS, FRONT ROW FROM LEFT: ADVISER ED BROKESH, CLIENT NEAL GUGLER; BACK ROW FROM LEFT: DAVID LEISZLER, PETER MASTERS AND AUSTIN SCHMITZ

KANSAS AGRABILITY CLIENT, NEAL GUGLER, REMOVES NET WRAP FROM A LARGE ROUND BALE.

CAMP DAISY HINDMAN — LAKE ODONATA

BSE senior design projects are as unique as they are challenging. In the summer of 2015, the Girl Scouts of NE Kansas asked if a team of students could study Lake Odonata at Camp Daisy Hindman in Dover, Kansas. The lake was built around 1920 and has lost depth in its outer reaches due to sedimentation. This loss of depth has prevented canoeing in areas of the lake. Additionally, the lake's water quality is less than desirable at times, which discourages campers from swimming and canoeing. The loss of depth and water quality concerns impair the lake's usefulness for scouts staying at the camp and diminish their overall experience there.

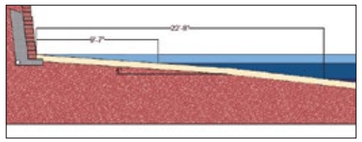
A senior design team of Laura Wilson, Erica Schmitz, Kayla Wehkamp and Margaret Spangler was given the project of studying the lake and providing the Girl Scouts with some guidance to improve the lake's recreational value. The design team, SW2Solutions, conducted a site survey and several site studies including bathymetric and indicator species studies. The team conducted several model simulations including WinTR-55 and a water erosion prediction project (WEPP) model to investigate the lake's health. After the site surveys and model simulations, the team was able to provide the Girl Scouts with suggestions for the lake.

LAKE ODONATA SITE DESIGN OVERVIEW BY SW²SOLUTIONS SENIOR DESIGN TEAM

FROM LEFT: ERICA SCHMITZ AND LAURA WILSON TAKE BATHOMETRIC SURVEY DATA.

The team determined the lake had only lost minimal depth due to sedimentation. It also had a Eurasian watermilfoil (Myriophyllum spicatum) infestation that impacted the lake's water quality, but the indicator species survey indicated that ecologically the lake was in good health. For improvements, the team proposed a dredging program to increase depth in desired canoeing areas and removal of the milfoil habitat. Several biological milfoil control strategies were provided to improve the lake water quality.

The design team proposed a swimming beach design, canoeing pier and construction of a hiking trail. The construction of sedimentation catch basins were proposed to maintain the lake depth for years to come.



BEACH DETAIL FROM DESIGN REPORT

SENIOR DESIGN WITHIN THE KSU BAE DEPARTMENT

The KSU Biological Systems Engineering Senior Design class is a three-credit, capstone class offered annually during the fall semester. Students who enroll in the course are in the last two or three semesters of their college career. Because of the single-semester format, a successful design project will propose a design ready for construction, at minimum, by the end of the semester. In an industrial setting, the projects would be at the point where management determines if a project is approved for prototype construction. To actually build their projects, students are encouraged to take an elective companion design class, Biological Systems Engineering Design Project, during the spring semester following senior design. During this second semester class, students will further develop their project, build a prototype and conduct testing. Project teams consist of three to five students, with the preferred team size being four students.

The ideal senior design project will have a customer/client that has a problem in need of a solution and will have a high likelihood of being built, should the proposed design be approved by the customer/client.

In all, KSU/BAE Senior Design class teams have won first place in national student design competitions 12 times, finished second twice and placed 3rd two times. Additionally, design teams in the BSE Senior Design course have worked on quarter-scale tractor designs that have gone on to win competitions. BSE Senior Design course projects over the years have received patents, aided disabled farmers, improved products, developed research tools, addressed urban water problems and solved many other problems for farmers, businesses, individuals and researchers.

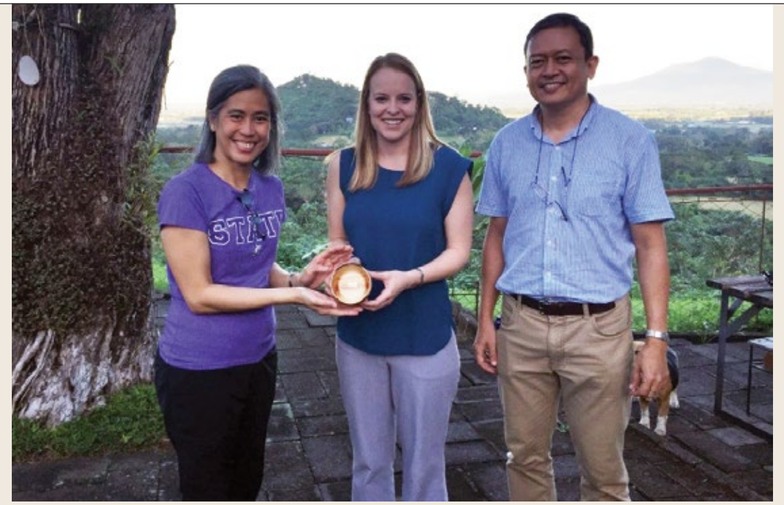
PHILIPPINES STUDY TOUR JANUARY 2016

Ronaldo Maghirang and Lisa Wilken, BAE professor and assistant professor, respectively, along with BSE seniors Erica Schmitz, Bridget Paulk and Jade Edmonds, spent two weeks in the Philippines visiting institutions involved in sustainable development. Locations visited include Calamba, Tagaytay, Los Baños, San Pablo City, Laoag, Pagudpud, Kapurpurawan, Paoay, Manila, Makati, Science City of Muñoz and Corregidor Island. The purpose of the travel was to provide K-State students and faculty a unique opportunity to gain international experience and learn about agricultural development programs in the Philippines.

Faculty and students had the opportunity to interact with faculty, students and researchers at several institutions including the University of the Philippines-Los Baños (UPLB), International Rice Research Institute (IRRI), Mariano Marcos State University (MMSU), United States Agency for International Development (USAID), Central Luzon State University (CLSU), Philippine Carabao Center (PCC) and the Philippine Rice Research Institute (PhilRice). Highlights of the trip included dinner with newly inaugurated CLSU president and K-State alumnus, Tereso Abella; visiting the hydroponics research farm in Munoz; learning about U.S.-Philippine World War II history during the Corregidor Island tour; discussing environmental issues in the Philippines with former assistant secretary for the department of science and technology, Marilou Orijola; tour of the IRRI grain quality laboratory; warm hospitality and local cuisine: carabao milk and tilapia ice cream, pancit, fresh fruit (yellow watermelon, mango, pineapple, papaya), pastillas de leche; MMSU victory celebration dinner with acting president Prima Fe R. Franco; and the beautiful weather and scenery.

ABOVE: LISA WILKEN PRESENTS HER RESEARCH AND TEACHING PROGRAM TO FACULTY AND STUDENTS AT MARIANO MARCOS STATE UNIVERSITY, BATAC, ILOCOS NORTE, PHILIPPINES.

RIGHT, FROM LEFT: RONALDO MAGHIRANG; ARNEL DEL BARRIO, FORMER K-STATE VISITING SCIENTIST; EDWIN ATABAY, CLSU-PCC ADMINISTRATOR; BRIDGET PAULK; TERESO ABELLA, CLSU PRESIDENT; JADE EDMONDS; LISA WILKEN; ERICA SCHMITZ; AND DANIEL AQUINO AT CENTRAL LUZON STATE UNIVERSITY, SCIENCE CITY OF MUÑOZ, NUEVA ECIJA



Wilken and Maghirang presented "Kansas State Biological and Agricultural Engineering Programs" at UPLB. Wilken also presented "Bioprocessing and bioseparations research highlights" to researchers at IRRI and "Current status of bioprocessing and bioseparations research and teaching programs at Kansas State" to faculty and students at MMSU. Maghirang was the guest of honor and keynote speaker at the MMSU 38th Foundation Anniversary Celebration and discussed "Academic journey across cultures: from here to there. "

The faculty and students acknowledge the John Deere Foundation and the department of biological and agricultural engineering for the generous support, the host institutions (UPLB, MMSU, IRRI, PhilRice, PCC, CLSU and USAID) for the terrific educational experience, and the numerous K-State alumni and friends for their assistance in planning and/or serving as hosts and tour guides, and ensuring the success of the trip.

ABOVE LEFT: LISA WILKEN PRESENTS SANDY SAPLALA-YAPTENCO AND KEVIN YAPTENCO, UPLB AGRICULTURAL ENGINEERING PROFESSOR, WITH A K-STATE WOODEN BOWL FOR THEIR WARM HOSPITALITY. THE BOWL WAS DESIGNED AND MADE BY LISA'S FATHER, LARRY WILKEN.

ABOVE RIGHT, FROM LEFT: RONALDO MAGHIRANG, LISA WILKEN, CASIANA VERA CRUZ, JADE EDMONDS, ERICA SCHMITZ AND BRIDGET PAULK AT THE INTERNATIONAL RICE RESEARCH INSTITUTE IN LOS BAÑOS

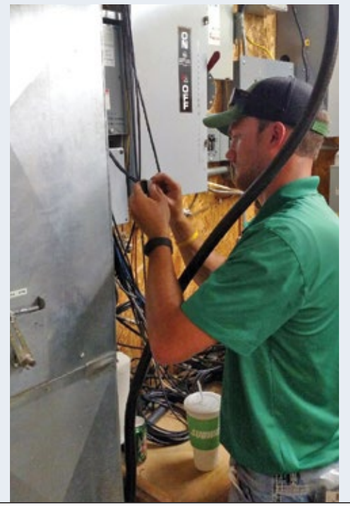
LEFT: RONALDO MAGHIRANG, BAE PROFESSOR, PRESENTS PRIMA FE R. FRANCO, ACTING MMSU PRESIDENT, WITH A KANSAS STATE ENGINEERING GIFT FOLLOWING HIS KEYNOTE LECTURE AT MARIANO MARCOS STATE UNIVERSITY.

AGRICULTURAL TECHNOLOGY MANAGEMENT — THE PROGRAM OF CHOICE

The agricultural technology management, or ATM, academic program has served alumni for more than 50 years with a solid foundation in technology, agricultural sciences and business management. Alumni utilize these foundations daily in their vast career opportunities. The ATM program attracts students seeking these foundations and the opportunity to tailor a four-year academic program to their career aspirations — with careful planning many students graduate with one or more academic minors in a four-year duration — by working with an academic adviser in the BAE department. These have been hallmarks of the ATM program for decades.

ATM students at K-State achieve many successes every year in the BAE department, College of Agriculture, the university and through experiential career activities. Summer months provide keen opportunities for students to explore career aspirations through structured and supervised internships.

During the summer of 2016, 11 ATM students participated in internships that focused on the application of precision agriculture technologies, variable-rate technologies, manufacturing systems and technologies; terminal elevator management; and applying crop production services to producers. Common threads emphasized in all ATM internships is the ability to effectively communicate and work with people. BAE faculty and students are grateful to all individuals working with our students on internship programs, creating a win-win situation for both the internship employer and our students.



BAE MACHINERY GROUP

INDUSTRY COLLABORATION

Research Projects:

CARETAKER. Austin Schmitz, concurrent BS/MS student in BAE, has started on a project funded by the Kansas Corn Commission under Dan Flippo, assistant professor in biological and agricultural engineering. This work is in the second year of a four-year project that seeks to combine robotic vehicles with image processing to spot and identify pests in corn autonomously. The vision for this project is to have a swarm of small autonomous vehicles to patrol a corn field and relay pest information, as well as use micro spray or other means to mitigate any infestation.

PEST SAMPLING FROM UAV. Phillip Dix, graduate student under the supervision of Dan Flippo, is working on a system that will drop from a UAV over a field to sample pests for later identification. Dix has also designed and built a UAV simulation test-bed to aid in his work and future UAV payload systems.

ADVANCED PLANTING TECHNOLOGY. Ryan Strasser and Sylvester Badua (B.S./M.S. and Ph.D. students, respectively) are working under the supervision of Ajay Sharda, assistant professor in biological and agricultural engineering, on this project supported by Horsch GmbH, Germany. Strasser has designed a test bench for rapid optimization and testing of planter automatic downforce control system. The system would automatically simulate typical in-field planting conditions and optimize downforce control system behavior to continuously maintain seed depth. Seed depth has significant bearing on germination and yield. Thus, a control system which can maintain seed depth with changes in terrain and soil type would be a big leap forward for high-speed planting systems. Badua's focus is on "downforce control system response on real-time soil texture and terrain variability." Quantifying response of the planter control system with automatic downforce under diverse operating conditions is critical to technology development and producer adoption. He is conducting multi-location on-farm evaluation of technology by engaging cooperators in three counties.

IRRIGATION SCHEDULING FOCUS OF MULTI-STATE PROJECTS

While irrigation scheduling is nothing new in irrigation management, there is renewed interest across several states underlain by the Ogallala aquifer. New technology may allow irrigation scheduling to become more seamless with current agricultural practices and further increase user friendliness. Irrigation scheduling refers to the decision-making process of determining when and how much water to apply to an irrigated field in order to achieve the yield goal.

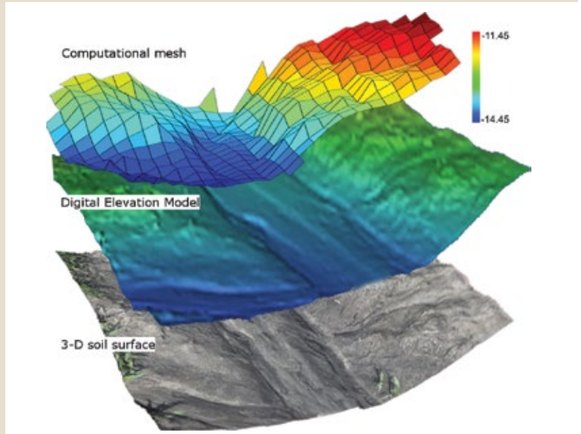
There are several ways of implementing irrigation scheduling, but the two most popular methods are soil water measurement, and moisture and crop evapotranspiration or crop water use. Soil water sensors are used to estimate the amount of water in the soil. Recent advances in electronics and telemetry have led to many soil water sensors options, causing farmers to wonder which soil water sensors they should use. The main goal of the USDA-Natural Resources Conservation Service's Conservation Innovation Grant multi-state project is to help producers learn which of the different soil water sensors available on the market are appropriate to their field conditions, and will provide them the most accurate and useful information to implement irrigation scheduling. Kansas State University, Oklahoma State University (lead) and Texas A&M AgriLife have established several sites at different farms to demonstrate performance of the soil water sensors.

Part of the multi-million, multi-objective project with the USDA- National Institute of Food and Agriculture is to continue improvement and use of ET-based irrigation scheduling tools from Kansas State University (for KanSched), Colorado State University (for WISE) and Texas A&M AgriLife (for DIEM), among others. The goal for this project objective is to improve existing irrigation scheduling tools to include improved, more user-friendly interfaces with other management technology such as the soil water sensors that provide complimentary irrigation scheduling information. It includes the goals of training students in development of the tools, and incorporating short- and medium-term weather forecasts to estimate irrigation requirements. This is just one of the many objectives Kansas, Oklahoma, Colorado, Nebraska, Texas and New Mexico hope to address in sustaining agricultural productivity in the region underlain by the Ogallala aquifer.

NEW TECHNIQUES FOR EVALUATING SOIL EROSION

Soil erosion on cultivated cropland is a major source of anthropogenic soil degradation in the Central Great Plains. An understanding of the underlying physical processes and developing management practices is important and relies on use of better evaluation techniques of soil losses.

A team of BAE students and faculty led by Aleksey Sheshukov, assistant professor, is applying several soil surveying techniques to evaluate soil and ephemeral gully erosion in agricultural fields, including laser-scanning total station, mobile camera-based photogrammetry and aerial photography with UAV. The produced digital elevation models are used in physically based computational models.



LAYERS OF SOIL SURFACE, DIGITAL ELEVATION MODEL AND COMPUTATIONAL MESH

BAE GRADUATE STUDENTS CHINTHAKA BANDARA (LEFT), VLADIMIR KARIMOV (MIDDLE), AND KARI BIGHAM (RIGHT) WITH WATERSHED SPECIALIST, WILL BOYER, USE DIFFERENT SURVEYING TECHNIQUES TO EVALUATE SOIL EROSION ON A SORGHUM FIELD SOUTHEAST OF MANHATTAN, KANSAS.

CHINA TRIP

SUMMER 2016

Providing access to adequate quantities of clean water is a concern for communities all around the world. Water resources and environmental engineers at Kansas State University are working to develop solutions for the global community by enhancing their cultural awareness and learning about complex water issues outside of the United States.

Graduate students Kelsey McDonough and Kari Bigham accompanied Professors Stacy (BAE) and Shawn Hutchinson (geography) to China this past June. They completed teaching and research collaboration visits with Jilin University, Changchun; Three Gorges University, Yichang; and the Enshi Autonomous Prefecture Academy of Agricultural Sciences in rural Hubei Province. They also participated in the 2016 International Workshop for Water Resources Utilizations and Management at Three Gorges University. The Hutchinsons are currently working to develop a study abroad program at Jilin University for undergraduate students, focused on water resources and management.

RESEARCHERS DEVELOP 3-D PRINTED DIAGNOSTIC DEVICE TO RAPIDLY DETECT ANEMIA

Kim Plevniak, BAE M.S. student, and Mei He, BAE assistant professor, at Kansas State University developed a low cost, point-of-care device using a 3-D printer to make quick diagnosis of anemia from a drop of blood. The device can attach to a smartphone companion app for informing anemia status that may due to imbalance of food nutrition or diet.

Anemia affects 2 billion people worldwide, including more than half of preschool children and pregnant women in developing countries, and at least 30 percent of children and women in industrialized nations. The 3-D printer-fabricated device does not require laboratory settings for testing, and allows individuals living in rural area or developing countries to access to health care.

KIM PLEVNIAK

NEW TECHNOLOGY FOR FULL UTILIZATION OF NON-STRUCTURAL CARBOHYDRATES IN SWEET SORGHUM

Donghai Wang's research group, in collaboration with Bill Rooney, Texas A & M University, has developed a technology to fully utilize non-structural carbohydrates in sweet sorghum for a biofuel production diffusion process.

Sweet sorghum is a specific type of sorghum that stores a high concentration of soluble sugars in the stalk and also produces grain in the panicle. At present, the industry uses the same method for processing sweet sorghum that is used in the sugarcane industry. The sugarcane industry recovers at least 95% of the fermentable sugars from the stalk, using a diffusion process based on hot water extraction.

However, sweet sorghum is not identical to sugarcane as sweet sorghum produces significant quantities of grain in the panicle, predominantly starch. Currently, when using the sugarcane harvest approach for sweet sorghum, the sorghum plant is "topped" and the panicle is cut and dropped on the ground; it is not included in the biomass brought to the processing plant.

The team has developed technology to fully utilize fermentable sugars, starch in the panicle and no-structural carbohydrate in the stalk from sweet sorghum using a diffusion process. A thermal stable enzyme was used to convert starch into fermentable sugars during the diffusion process. With this technology, they achieved 96% starch conversion efficiency and 98% sugar recovery efficiency, respectively. The patent application for this technology is under process. Nana Baah Appiah-Nkansah, a Ph.D. candidate, has also been working on this project.

NANA BAAH APPIAH-NKANSAH

INDIA AND MAHINDRA VISITS SUMMER 2016

Ajay Sharda, BAE assistant professor, visited India to participate in a multi-institutional project meeting focused on collaboration on a major initiative in India on the project "Start Up Rural India — from Farm to Fork in Soy/ Millet Value Addition," June 2-4, 2016. Sajid Alavi, professor in grain science at Kansas State University, initiated and put together a multi-institutional public-private international consortium for this project whose partners include K-State, Central Institute of Ag Engineering (CIAE), Solidaridad (non-profit organization), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Central Institute of Post Harvest Engineering & Technology (CIPHET), Punjab Ag University, Acharya NG Ranga University, National Agro (private partner based in Punjab), Assocom-India (private partner for rural skill development), and other private and public institutions. Sharda is leading a project at K-State to develop a robust research plan for a planting system involving inter-cropping of soybeans and millets.

During the meeting, Sharda also interacted with R&D engineers from Mahindra and Mahindra (M&M) to explore collaborative research opportunities with faculty in the BAE department at Kansas State. M&M is India's largest tractor manufacturer with a significant presence in the United States, particularly in the under-120 hp segment.

He also visited Punjab Agricultural University in Punjab to interact with faculty and students, along with meeting manufacturers and producers June 14-16, 2016. He gave an invited talk on the topic "Sensing and automation on agricultural machinery systems" at the College of Engineering and Technology, PAU, Ludhiana on June 15, 2016. The invited talk was co-organized by the Punjab Chapter of Indian Society of Agricultural Engineers (ISAE) and Alumni Association of COAET, PAU, Ludhiana, as well as Jaskaran Singh Mahal, dean of the College of Agricultural Engineering and Technology. COAET presented Sharda with an award of honor and reiterated the commitment to continue efforts to foster a long-term collaboration for research, teaching and training between the two institutions.

PROFESSOR SHARDA DELIVERS INVITED TALK AT COLLEGE OF AGRICULTURAL ENGINEERING AND TECHNOLOGY, PUNJAB AGRICULTURAL UNIVERSITY, PUNJAB INDIA.

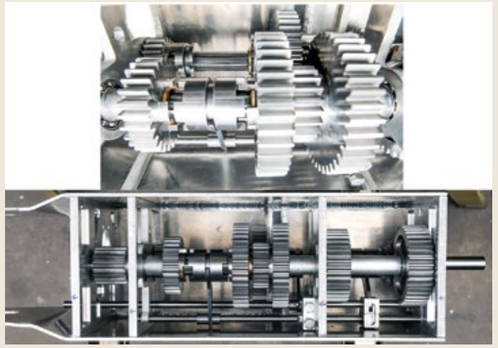
As a follow up of the meeting with M&M, S. Sudarsanam, deputy general manager, head – build, validation and homologation, farm machinery, Chennai India, visited Kansas State University from June 30 through July 1, 2016.

ED BROCKESH, BAE INSTRUCTOR, DAN FLIPPO, BAE ASSISTANT PROFESSOR AND S. SUDARSANAM

2016 QUARTER-SCALE TRACTOR TEAM

KSU-BAE Powercat Tractor team successfully competed in the 2016 ASABE IQS competition in Peoria, Illinois in June. The competition consisted of several events, including three tractor pulls, maneuverability event, design judging, sound testing, written report, presentation and a durability course. The 2016 team took home second-place overall honors this year.

The 2016 Powercat Tractor, two-wheel drive design, included an adjustable-length frame that extended the vehicle length by 18 inches, lateral active-weight displacement steering and an original three-speed transmission with ratios specifically designed for each of the events.



2016 THREE-SPEED ORIGINAL TRANSMISSION

The new design competed very closely with the eventual competition winner. Overall K-State had 2240 points behind the winner with 2284. Third place had 2089.

The 2016 effort started in the fall of 2015 with extensive tractor configuration testing. Development continued through the winter with the final tractor design being built in April 2016 for the June competition. The 2016 tractor team consisted of student members majoring in biological systems engineering, agricultural technology management and mechanical engineering.

THE 2016 POWERCAT TRACTOR COMPETES ON THE MOBILITY COURSE, DRIVEN BY TYLER MONTGOMERY, BSE SENIOR.

BSE SENIOR RYAN STRASSER IN 2016 PULLING RUN

2016 KSU POWERCAT A AND X TEAMS

FOUNTAIN WARS TEAM MAKES IMPRESSIVE SHOWING

K-State's Fountain Wars team earned four awards and placed second overall in an international design-build competition in July in Orlando, Florida. Advised by Trisha Moore, BAE assistant professor, the student team received a $1,000 prize and trophy for its entry in the Fountain Wars Competition, a segment of the G.B. Gunlogson Student Environmental Design Competition at the American Society of Agricultural and Biological Engineering's annual international meeting.

After making a brief, marketing-style promotion of their design, each team constructed its system in 120 minutes, in the rain — an extra challenge this year.

The K-State team scored top marks in the technical tasks for 2016: the "beach ball high jump" and "rescuing the dolphin." For the "beach ball high jump," teams were required to use water force from their fountains to launch a beach ball into free flight and clear heights of 5-8 feet.

The "rescuing the dolphin" task included two PVC pipes next to each other, one of which had a plastic dolphin bath toy lying in the bottom. Teams were challenged to shoot water through a hole into the adjoining tube to raise the dolphin and push it out of the apparatus. All teams were able to inject water into the pipe, but the next steps were trickier.

"For most teams, once the dolphin rose to the top of the tube, it would sit on the cushion of water and not come out," Moore said. "Because our team members spent plenty of time testing and adjusting their design, they were one of the only teams to fully accomplish the task."

The team's design concept also earned an additional award: most innovative design.

Awards were based on combined scores of a written report, oral presentation, construction, the technical tasks and aesthetic display.

The Fountain Wars team members are: Angelica White, Alison Cioffi, Jessica Stanton, Jesse Laning, Joe Hewit, John Wempe, Cody Deas, Aaron Akin, Alexander Coon, Devon Bandad, Chris Gillespie and Teddy Gillespie. Dr. Trisha Moore, advisor.

Read more at http://www.k-state.edu/media/newsreleases/aug16/fountainwars81016.html

THREE FROM KANSAS STATE UNIVERSITY NAMED TO FELLOW STATUS

The American Society of Agricultural and Biological Engineers, or ASABE, recognized three Kansas State University professors as Fellows during ceremonies at its 2016 annual international meeting July 17-20, in Orlando, Florida.

With the number of candidates elected to Fellow grade each year limited to 0.2 percent of the total ASABE membership, to have three of this year's 13 recipients from one university is a remarkable achievement.

Gary Clark, senior associate dean in the College of Engineering; Joe Harner, professor and department head of biological and agricultural engineering; and Xiuzhi Susan Sun, a university distinguished professor in the department of grain science and industry, and ancillary faculty of biological and agricultural engineering, were each recognized for their "unusual professional distinction, with outstanding and extraordinary qualifications and experience in, or related to, the field of agricultural, food, or biological engineering."

Fellows must have had 20 years of active practice in the profession of engineering, the teaching of engineering, or teaching in an engineering-related curriculum.

Read more at http://www.k-state.edu/today/announcement.php?id=28342

DEPARTMENT NEWS

NEW FACULTY

Vahid Rahmani joined the BAE department as an assistant professor in late spring. His research interests include climate change and variability impacts on water resources management, extreme weather event analysis and water supply. Currently, his group is working on a few projects to promote water supply protection, and to improve sustainable management of the available water in small impoundments and large reservoirs. He has diverse interdisciplinary interests and always seeks new opportunities to help the citizens of Kansas. He is located in Seaton 049 and would be happy to discuss any water-related subjects.

BSE STUDENTS PLACE IN ENGINEERING UNDERGRADUATE RESEARCH POSTER FORUM

FROM LEFT: TYLER MONTGOMERY, ASSOC. DEAN NOEL SCHULZ, LARS PETERSON AND RYAN STRASSER

FROM LEFT: LAURA WILSON, ASSOC. DEAN NOEL SCHULZ, ERICA SCHMITZ AND MAGGIE SPANGLER

On December 3, 2015, 46 engineering undergraduate students from eight engineering departments participated in the Undergraduate Research Poster Forum sponsored by the Office of Engineering Research and Graduate Programs. Thirty posters were presented. In the Design/Build/Team/Class-Project Research Category BSE seniors Ryan Strasser, Tyler Montgomery and Lars Peterson won first place ($500 award), for their poster *Tractive Performance Research*. In the same category and winning second place ($300 award) were Erica Schmitz, Margaret Spangler and Laura Wilson, BSE seniors. Their poster was *Best Management Analysis for Shallow Water Depths at Lake Odonata*. The adviser for both groups was Ed Brokesh, BAE instructor. Congratulations to all on a job well done!

STAN CLARK SURROUNDED BY STUDENTS

THE ETHIOPIAN CONNECTION

LeAnn and Stan Clark began volunteer work with Ethiopia Reads in 2003. The nonprofit organization currently brings literacy to more than 130,000 children through its 72 libraries in all regions of Ethiopia. Ethiopia Reads has also constructed five schools in remote, rural regions of the country.

Nearly half a million books for these libraries have been collected, sorted and prepared for shipment by the Clarks. Since their retirement, LeAnn and Stan have focused on book collections, funding for shipment, and training for teachers and librarians in Ethiopia. The couple has visited the African country several times to support Ethiopia Reads staff and librarians. K-State Professor Laurie Curtis, department of curriculum and instruction, also volunteers expertise to improve library efficiency and provide training for the librarians.

LEANN CLARK AND ETHIOPIA READS STUDENTS IN ETHIOPIA

STUDENT SCHOLARSHIPS TAKE PRIORITY THROUGH ANNUAL, MATCHING AND ESTATE GIFTS

Stan and LeAnn Clark were high school sweethearts in Chapman, Kansas. They married while students at Kansas State University, where LeAnn earned a bachelor's degree in elementary education, and Stan earned bachelor's and master's degrees in agricultural engineering.

Fast forward 55 years and the couple is making a significant difference at K-State by volunteering their time and consistently supporting scholarships in their colleges.

In addition to giving cash each year, the Clarks named Kansas State University as a beneficiary on life insurance policies to further support their scholarships for generations to come.

"We just wanted to help students who needed assistance," said Stan, who serves on the College of Engineering dean's advisory council and previously served on the department of biological and agricultural engineering advisory council.

LeAnn serves on the College of Education dean's advisory council and previously served on the K-State alumni advisory board. Stan, who retired from a career of designing farm machinery, also serves as a judge at the annual quarter-scale tractor competition, judging the work of student teams from K-State and other schools.

"I always come back rejuvenated about the future of our country, just from that association with exceptional young engineers," he said.

As for including a gift for K-State in their estate plan, Stan said it was easy with guidance from the KSU Foundation and his financial adviser. "It's something that has been on our to-do list for some time," he said. "We want to do whatever we can to support the university."

Generous K-State supporters like the Clarks help drive momentum for the $1 billion to advance the goals of K-State 2025.

To support the department of biological and agricultural engineering, contact the engineering development office at giftoptions@found.ksu.edu or make a secure, online gift to the department's excellence fund now.

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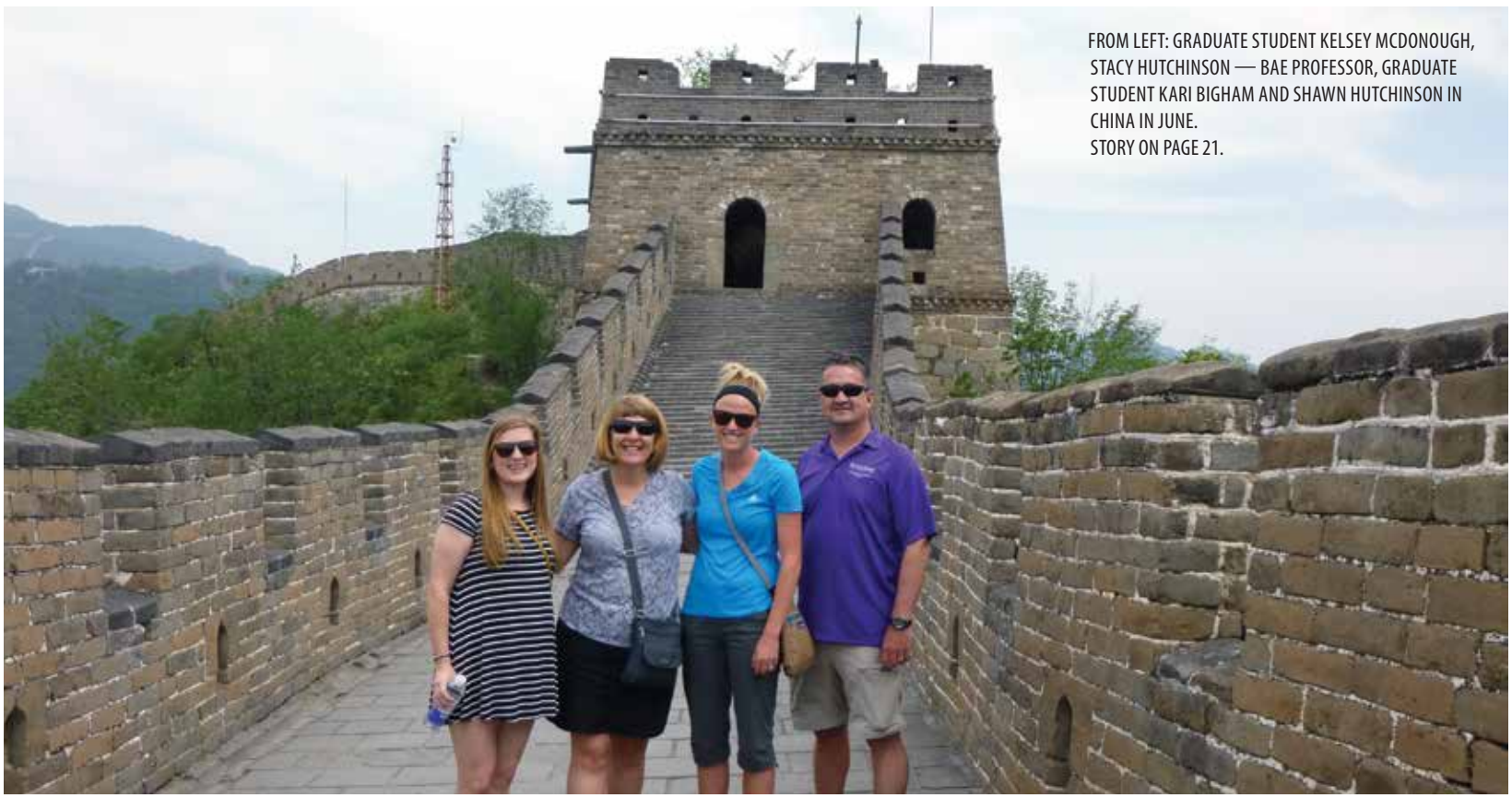

FROM LEFT: GRADUATE STUDENT KELSEY MCDONOUGH, STACY HUTCHINSON — BAE PROFESSOR, GRADUATE STUDENT KARI BIGHAM AND SHAWN HUTCHINSON IN CHINA IN JUNE.
STORY ON PAGE 21.