Biological Systems Engineering
UNIVERSITY OF WISCONSIN–MADISON

Fall 2020 Newsletter

Department Overview

As of this Fall semester, total enrollment in the Biological Systems Engineering Dept. is 201 students, with the following breakdown in specializations:

Specialization	Students
Food and Bioprocess	28
Machinery Systems	50
Natural Resources	42
General Program	18
Graduate Program	32

Featured Articles:

News from the Department Chair – Troy Runge

I hope that this letter finds you and yours safe and doing well. 2020 has certainly been a year that wishing each other well has meant more.

When I started writing this note for the newsletter, we had just started the Fall 2020 semester. We were teaching some classes in person; students were back on campus (albeit in masks). It felt like things were starting to return to normal. But this is 2020 - a year with many challenges. After one week, there was a surge in student COVID cases, and the campus is back to distance for at least two weeks.

Although this highlights a bit of the challenges on campus, in no way do I want to suggest we are not doing well. The faculty, staff, and students have created amazing new ways to safely continue the education, research, and outreach missions of the department. Wisconsin state's motto of "Forward" can truly be seen at work.

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CALS Awards: Equity and Diversity, Recipient Rebecca Larson

Rebecca Larson is an associate professor and extension specialist in the Department of Biological Systems Engineering (BSE), and recipient of the CALS Equity and Diversity Award. She has been a champion for equity and diversity in BSE for over 10 years through her research, outreach and service.

Larson has built a successful research group in BSE with an incredible diversity of backgrounds. She also seeks out projects that enable research to be carried out in developing countries designing and building anaerobic digesters to provide energy in places like Uganda and Bolivia.

Continued on Page...3

ASABE Update

The UW-Madison student ASABE chapter enjoyed an active Spring semester before the Covid-19 pandemic slowed all activities. Here's a summary of what's been happening.

- UW-Madison had the honor of hosting the 2020 Midwest Regional Rally that took place March 5-7, 2020. Students from Iowa State, UW-River Falls, and Ohio State came to Madison to attend. Students spent Friday on four separate tours sorted by major/interest; Animal Environments, Food/Bioprocess, Natural Resources, and Machinery Systems. Thank you to Statz Bros. Dairy Farm, USDA Forest Products Lab, Natural Resources Conservation Service, The Little Potato Company, Sassy Cow Creamery, and Kuhn North America for making the tours possible and helping us make MRR 2020 a rewarding experience. Saturday was spent touring the BSE department and our many faculty research labs. Thank you to the faculty members who participated and for taking the time to showcase their labs and research projects. All who attended greatly enjoyed all that UW and the city of Madison has to offer.

- The ASABE organization is currently working to organize virtual networking and social events due to the limitations and complications that the COVID-19 pandemic has presented.

ASABE Awards

Congratulations to this year's ASABE Awards recipients!

Parker Williams received the BSE Graduate-Student of the Year Award. Parker is a Master's student who is studying the correlation between compaction and UAV vegetative indices to predict forage quality loss due to machinery wheel traffic under the guidance of Dr. Brian Luck.

Laura Rodriguez Alvarez received the BSE Student of the Year Award. Laura is an undergraduate student with an emphasis on natural resources and environmental engineering

2020 ASABE Student Officers	
President - Jared Merkel	Public Relations - Priyanka Patel
Vice President—Jaime Pham	CALS Representative - Laura Rodriguez
Treasurer - Aidan Morrow	Social Chair - Rachel Steiner
Secretary - Jordan Main	Engineering Expo Chair - Evan Erb
Fundraising - Luke Powers and Lee Hermus	Midwest Regional Rally Chair - Sean

People of BSE

ASABE Faculty Awards

Dr. Kevin Shinners (pictured right) received the Career Achievement Award. Dr. Shinners is a professor in the BSE department and an adjunct professor in the Mechanical Engineering Department. Dr. Shinners' work has been focused on a variety of technical areas relating to forage and biomass harvesting, processing, transport, and storage.

Dr. Brian Luck received the Young Engineer Achievement Award. Dr. Luck is an assistant professor and extension specialist in the BSE department. His work has been focused on the development and implementation of data acquisition and control systems for crop and animal production systems.

Departures and New Arrivals

Joining both BSE and the Soil Science Department is Dakota Wagner. Dakota is taking on the role of Financial Specialist in both departments and working mainly on grants in both the pre-award and post-award areas. He recently moved to Madison from Fond du Lac and received a finance degree and Spanish minor from the University of Wisconsin - Whitewater.

Congratulations to Dr. Astrid Newenhouse on her recent retirement. Newenhouse has worked for the University of Wisconsin for over 30 years as academic staff in a career marked by a broad variety of research and outreach interests. Astrid's CALS career started in the Department of Horticulture, and in the Environmental Resources Center (now the UW-Madison Division of Extension Natural Resources Institute). Her BSE history began in 1994, when she met Ron Schuler and Cheryl Skjolaas while working in the state 4-H office. A few years later, she joined Larry Chapman's agricultural safety research group working on the Healthy Farmer, Healthy Profits project that lasted 16 years. Most recently, Dr. Newenhouse worked with Doug Reinemann on rural energy issues with the Rural Energy Council. We want to thank Astrid for her years of service and wish her all the best.

CALS Awards: Equity and Diversity from Page 1...

Through Larson's Extension appointment she provides support for county agents and farmers throughout Wisconsin. She works with a wide variety of stakeholders in terms of ethnic backgrounds, educational levels, and political beliefs.

In 2017, Larson spearheaded an effort to encourage more women to use the BSE fabrication shop by instituting a Women's Shop Night. Larson has worked tirelessly at promoting the BSE shop night series both internally in the BSE department as well as across campus. The shop night has grown steadily from approximately 5 students the first year to a capped maximum of a dozen this year.

Larson has been part of the CALS Equity and Diversity Committee and has led the BSE efforts the last several years. Her work has gone beyond ensuring training events, such as the Hostile and Intimidating Behavior Workshop and the Implicit Bias Training, to include encouraging her colleagues to actively discuss biases and promoting a climate of equity in the department. She is truly a champion in this area.

BSE Alumni News

UW Alumnus Alex Charvat Finds Golden Opportunity in TV Series "Reclaimed"

Uw-Madison alumnus Alex Charvat is the co-host of the Discovery Channel Series "Reclaimed", which features Charvat and his longtime friend Kevin Gilman working together to transform people's long-dormant mining claims into thriving operations. Charvat, in coordination with the producer, developed the idea for the show, which premiered on Thursday, Jan. 9 2020 at 8:00 p.m. CT (9:00 p.m. ET/ PT). For more information, check out the show's Facebook Page and Discovery Channel announcement page.

Charvat attended UW-Madison in the late 1990s, receiving his Bachelor's degree in Forest Science and his Master's degree in Biological Systems Engineering. He credits UW with teaching him about perseverance, a trait that has helped him be successful in his TV career and his business career. Charvat is the owner of Colorado-based structural engineering firm Alexander Structures, Inc., which focuses on log and high-end residential engineering and design.

Despite his busy schedule, Charvat was happy to answer a few questions about his career path and his new show Reclaimed.

So how did you get into TV, then?

"My favorite hobby - which is more like a passion - is shooting, and I've been doing it since I was six in every way, shape or form. That shooting continued at a much higher level at UW, where, as an undergrad, I was the captain of the UW - Madison Army ROTC rifle team - as a civilian.

In 2010, I saw an advertisement for a reality show called "Top Shot" on the History Channel. I applied and ended up placing 4th out of 50 contestants for the 16 slots on the show, so I made the cut. After Top Shot was over, I realized I craved the camera lens."

How have your UW degrees helped you along the way?

"My education and experience was - and still is - second to none in the log home engineering industry, thanks to UW-Madison. Most people in the log industry are self-taught. Some have forestry backgrounds, others engineering backgrounds. In 19 years of practice, I've met exactly one other engineer that also had a forestry degree. This combination gives me a unique set of expertise and has allowed me to rise to the top of an industry I'm passionate about."

BSE Graduate Receives ASABE Award

Congratulations to the late Larry R. Johnson for receiving the Wayne G. Russel Award. Larry Johnson finished his career as the owner of and principal consulting engineer for Oakwood Engineering LLC. He was a Professional Engineer with expertise in the manufacturing, engineering, business, and legal areas of major equipment manufacturers. He was very involved in product safety programs and standards development and was involved in developing standards for ANSI, ASAE, ISO, and CE. Larry Johnson received his master's degree from BSE.

BSE In The News

Research Early, Research Often—and Reap the Benefits

Critical thinking, sound judgement, mental endurance, exceptional communication and effective collaboration. These are not just human resources buzzwords. They are authentic skills and abilities that anyone can weave into their wok and everyday life - and be better for it. They are also among the many attributes students gain from exposure to scientific research. This is precisely why CALS has made hands-on research a signature experience for undergraduates.

Among all the schools and colleges at UW-Madison, CALS has one of the highest undergraduate research participation rates. The college's flexible curriculum accommodates research opportunities, whether independent projects under mentored guidance or supervised experiences in labs, that prepare students for a long list of careers and graduate school in many fields.

Lighting as a Lifesaver

For drivers of tractors, combines, and other farm implements, the risk of collisions with passenger vehicles may be higher than ever. Operators are working longer nighttime hours on larger, more widespread tracts of land in a tangle of urban sprawl. This means big, slow-moving vehicles are sharing busy public roadways with cars more regularly, and the disparities in speed, size, and visibility cause horrific crashes and hundreds of injuries and deaths every year. Poor lighting or reflectance is often a culprit.

"If you're on a big combine, and you've been out working all day, and you've got to run it from point A to point B, and it's 9 o'clock at night, late October, you may or may not know that you've got a burned-out flasher or a burned-out taillight," says Biological Systems Engineering (BSE) Professor John Shutske.

The problem calls for a technological solution. Fortunately, Shutske advises four BSE undergrads - seniors David Barrett, Carolyn Mahn, Connor O'Brien, and Eric Western - who researched and developed a device that automatically alerts vehicle operators of problems with their lighting systems. It also provides assurance that lighting and markings are in compliance with federally mandated standards.

Message from the Chair from Page 1

Our student numbers, job placements, research productivity, and outreach events have all continued to be strong. Much of this can be attributed to the support of our alumni who have continued to recruit our students for jobs, partnered with our faculty in research, and donated to the department to support scholarships and programs. Thank you for this support & "On, Wisconsin."

Shutske Among Those Working to Improve Farm Safety in Wisconsin

Wisconsin had 75 farm fatalities in 2017-18, according to a new effort restoring annual farm death reports that stopped in 2006 after beginning in 1943.

Of the 75 deaths related to farm work over the two years, 40 involved transportation, such as operating a tractor in a field or on a roadway. Blunt trauma, such as falling equipment or trees, caused 12 of the deaths. Entanglements on moving parts — such as power take-offs, devices that transfer mechanical power from an engine to another piece of equipment — accounted for nine deaths. Six people died from falls.

Agriculture workers are up to eight times more likely to die on the job than workers in other industries, according to the National Farm Medicine Center in Marshfield. The center, along with the Marshfield Clinic Research Institute, the UW-Madison Division of Extension and UW's College of Agricultural and Life Sciences, restarted the annual reports to bring attention to farm fatalities and ways to prevent them.

"Farm safety—reducing the risk of fatal and non-fatal injury—needs to go beyond simply advocating that people use common sense or urging them to be careful," John Shutske, director of the UW Center for Agricultural Safety and Health, said in a statement. "They must take a purposeful action—making machines, equipment, and the work environment as safe as possible by eliminating hazards and changing practices."

UW faculty and others working on farm safety compiled reports from 1943 to 2006 based on newspaper clippings and other sources, but the effort was stopped because the university no longer had a faculty member conducting safety-related research.

Shutske joined the new effort, using AgInjuryNews.org and state death certificates to help gather data. AgInjuryNews.org has the largest database of publicly available U.S. agricultural injury and fatality reports, compiled primarily from media reports.

According to new annual reports, 41 farm fatalities were recorded in 2017 and 34 in 2018. From 2004 to 2006, the annual average was 27.

The reports for 2017-18 added roadway deaths involving farm-related equipment, which accounted fro 29% of deaths those years.

"Most people think of farm safety as an issue of personal choice, but in the case of highway collisions involving slower moving ag equipment, it really crosses into the domain of public safety and health," Shutske said.

In 2017-18, 37, or nearly half, of the 75 deaths were among people 65 and older. Six deaths were among people younger than 18. "Slower reaction times among older people, along with long hours, stress and fatigue, can lead to serious injury and death," Shutske said.

Shutske encouraged safety measures such as installing rollbars and seat belts on tractors, avoiding roadway travel during low light or high traffic conditions and having updated lighting and marking systems on equipment.

BSE Plays Major Role in COVID-19 Response for Wisconsin Agriculture

Shortly after it became apparent that COVID-19 was likely to play a major role in the U.S., faculty in Biological Systems Engineering acted quickly through their respective state and national leadership roles. By the end of the first week of March, John Shutske, Professor and Director of the UW Center for Agricultural Safety and Health (ASH), had collaborated with Dr. Mark Stephenson, Director of Dairy Policy Analysis in CALS, and drafted the article, "*Six possible impacts of COVID-19 on farming.*" The article was later published by CALS and picked up by several hundred media outlets and venues nationwide and internationally. This article highlighted impacts that included: price impacts; supply chain shortages and slowdowns; impacts on farmer and farmworker health; impacts on PPE available to the ag industry; and other disruptions connected to schools, churches, services and other community resources. Much of this proactive work was informed by past experiences of Shutske who had previously worked on pandemic planning in the early 2000s with the U.S. Centers for Disease Control, NIH, DHS, state agencies, and university departments when at the University of Minnesota.

Dr. Shutske also played a major role along with Cheryl Skjolaas, Associate Director of the ASH Center and National Chair of the Extension Disaster Education Network (EDEN). Both individuals were selected by Extension Dean and Director Karl Martin to provide leadership to a statewide taskforce focused on educational programming around the COVID-19 issue. Shutske co-chaired the task force with Amber Canto of Extension's Health and Well-Being Institute. Skjolaas served a critical role as a liaison to the EDEN network. This kept Wisconsin closely connected to the work done by extension services in other states and the facilitation of innovations in educational programming and need identification. The group met frequently in the early days of the pandemic and set up rapid response communication systems and a database for sharing program resources.

Dr. Shutske and Ms. Skjolaas led efforts in a range of areas connected to BSE's role in agricultural safety and health. Examples of articles included:

COVID-19: I'm a farmer and I am afraid – what are my risks?
Precautions when taking delivery of seed, feed, and chemicals
My kids are now home from school – what farm jobs/chores can I safely give to them?

Numerous webinars, conferences and other online events were also done on Zoom covering topics such as stress management for state and federal agency personnel who serve agriculture; considerations when land-spreading milk oversupply; and suicide prevention for farmers and farm families. An example is the 90-minute webinar: Understanding the Pandemic's impact on Wisconsin Farms: What Conservation Agency staff need to know.

Through Cheryl Skjolass's work with the ASH Center, special arrangements were made with the U.S. Department of Labor to allow youth to participate in Extension's Youth Tractor and Machinery Safety programs using online delivery and allowing participants to do their "skill tests" using video captured on their family's or employer's farm as a way to minimize virus and risk exposure.

While the events associated with the 2020 pandemic have been extremely unfortunate, it has been an excellent opportunity for the BSE Department to play a major leadership role and for the UW Center for Agricultural Safety and Health to help coordinate and provide significant expertise to the important needs this pandemic has created. We also anticipate that many of the "ways of working" including making smart and efficient use of technology for communication and educational program delivery will continue well into the future.

Research Spotlight: BSE Investigators Developing Novel Method to Process Corn Stover

In the Fall of 2019, BSE faculty Digman and Shinners were awarded a $1.6M grant from the Biomass Engineering and Technology Office (BETO) of the Department of Energy (DOE). Their project investigates a novel harvesting and fractionation process for improved property control and utilization of corn stover.

Keagan Blazer and Benjamin Pike test a terminal velocity device that will be used to understand the utility of air classification for separation of grain and broken cob material in whole-plant corn feedstock.

The motivation for the project is that while corn stover represents over 70% of the crop residue available in the U.S., less than 60% is compatible with conventional baled logistics systems due to unwanted microbial degradation. The result is a persistent lack of ability to produce a reliable feedstock. Consequently, there are no real existing markets for corn stover.

Single-pass, Weather Independent Fractionation Technology (SWIFT) streamlines corn stover collection by eliminating multiple nonvalue added and weather-dependent steps that comprise the current technology in corn stover harvest. The unique approach envisions harvest and collection of high, dry matter, whole-plant corn (i.e., stover plus grain) combined with anaerobic storage and fractionation at the biorefinery.

At the biorefinery, SWIFT envisions not only separating the grain from the stover but also classifying the anatomical fractions of the stover by their response to chemical degradation (pretreatment) and hydrolysis into monomeric sugars that can be utilized for chemicals and fuels. In this way, we tailor pretreatments further improving the cost and environmental aspects of corn stover utilization.

The project will be led by 2020 BSE graduates Benjamin Pike (Franklin, WI) and Keagan Blazer (Shell Lake, WI). The BSE team will also be collaborating with Idaho National Laboratory, Iowa State University, POET, and John Deere Harvester Works.

Dairy Innovation Hub

In 2019 BSE was one of several CALS departments that successfully proposed the Dairy Innovation Hub to create innovations to benefit dairy and agriculture. The DIH is a collaborative effort between the three UW system schools with significant dairy related research (UW-Madison, UW-River Falls, and UW-Platteville). Since it's creation a year ago, BSE has been active in ramping up research in the four priority areas of 1) stewarding land and water resources, 2) enriching human health and nutrition, 3)ensuring animal health and welfare, and 4) growing farm businesses and communities.

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Alison Bowe

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Mitchell Schroepfer

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Congratulations to all scholarship and award recipients!

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Funding Update

Please consider making a contribution to one of the funds listed below:

- Biological Systems Engineering Fund
- Biological Systems Engineering Student Activities Fund
- Biological Systems Engineering Student Scholarship Fund

We sincerely wish to thank our alumni and friends who have generously supported the College of Agricultural and Life Sciences, Department of Biological Systems Engineering. Your gifts today are more important than ever as the University faces challenging budget constraints. Gifts made to the Department of Biological Systems Engineering help us with scholarship, facilities improvement, endowed professorship and graduate fellowships, and carry on our tradition as leaders and innovators in the Biological Systems Engineering field.

An invitation to join the prestigious Bascom Hill Society is extended to those who provide support of $50,000 or more to the department or to a specific project or program of their choice. You can pledge your commitment over a 10-year period, provide for a gift in your will, or give a gift of annuities or appreciated stock. If you have specific questions about giving, please contact Barbara McCarthy at the UW Foundation (Phone: 608-265-5891) Email: barb.mccarthy@supportuw.org).

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Two options to make a gift:

1. Visit the All Ways Forward campaign website at www.allwaysforward.org
2. Make checks payable to University of Wisconsin Foundation and return this form to:

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All Ways Forward will help to shape and ensure UW-Madison's lasting impact. Gifts to this campaign will fund initiatives and programs that will keep UW-Madison the world-class institution it is today. To learn more or make a donation please visit www.allwaysforward.org.

Thank you for your support.

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