Biological Systems Engineering
UNIVERSITY OF WISCONSIN-MADISON

BSE Newsletter

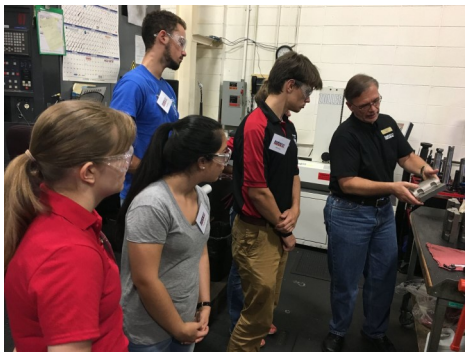
BSE Overview

As of this Fall semester, total enrollment in the Biological Systems Engineering Dept. is 218 students, with the following breakdown in specializations:

Specialization	Students
Machinery Systems	61
Natural Resources	46
Food& Bioprocessing	39
Structural Systems	6
General Program	66

There are also 41 graduate students in the department.

Read about featured professor **Becky Larson** on page 9.



In this issue

News from the Department Chair - Doug Reinemann

Welcome to the Fall 2017 BSE newsletter. We have continued our increasing enrollment trend and at last count had 218 undergraduates enrolled in our program. We have also continued the upgrade of our shop and lab space under the outstanding direction of Kody Habeck. If you get a chance to make a visit to the lower lab you will be impressed with the transformation.

I have accepted the position of Associate Dean for Extension and Outreach in the College of Agricultural and Life Sciences and will be starting in that role on January 1, 2108. It was a difficult decision, and is with mixed feelings that I will be moving up the hill to Ag Hall. I have truly enjoyed my term as department chair and have deep appreciation for the support of the faculty and your support over the last 4.5 years. I will retain a 25% appointment in the department and plan to help the department and new chair continue our continuous improvement efforts. I have especially enjoyed advising the Student club over the past several years. They have a really talented and active group of officers that represent the department very well to our prospective employers and to the ASABE national organization.

The extension enterprise is undergoing major change at the county level with the nEXT generation redesign being implemented and the recent announcement of the move of cooperative extension administration to the Madison campus. I am enthusiastic to participate in that process. I bring 28 years of past experience as an extension specialist as well as a vision for a vital and creative role to extend the Wisconsin Idea into the future across the boundaries of the state.

Continued on page 8.

American Society of Agricultural and Biological Engineers

Wisconsin Student Chapter

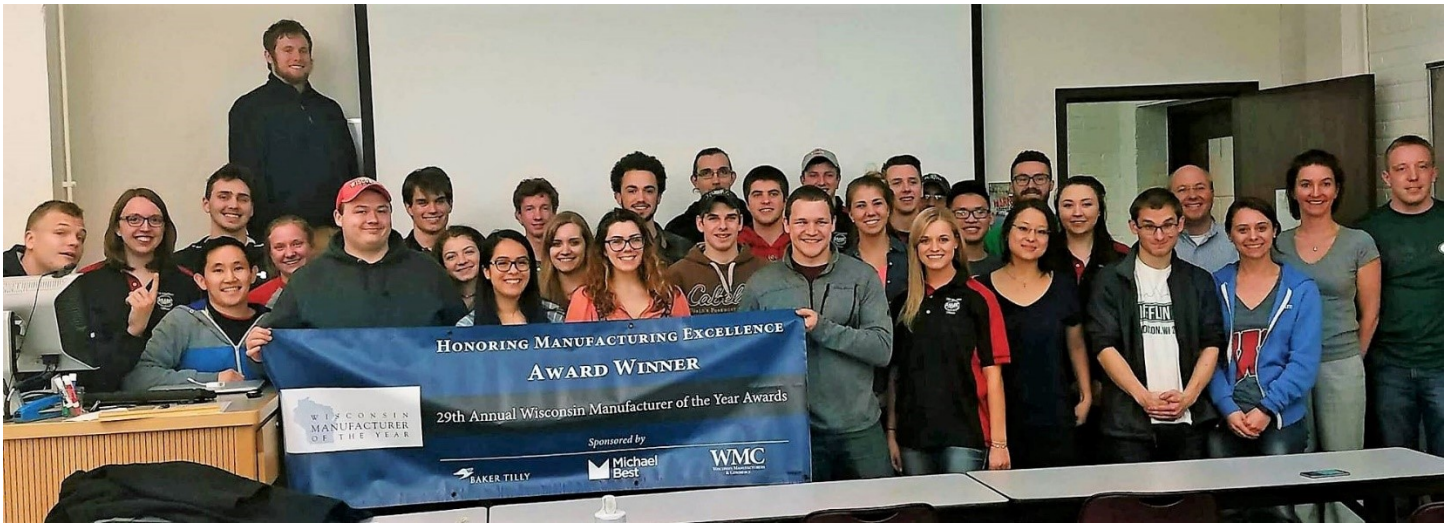
Update by President Grace Skarlupka

The UW-Madison ASABE Student Chapter has had an exciting 2017 so far!

The American Society of Agricultural and Biological Engineers (ASABE) is a student organization aimed at bridging the gap between students and industry. We host monthly meetings with industry speakers, go on industry tours, attend regional and international conferences and have social events.

We attended the Midwest Regional Rally Conference in Ames, Iowa in March where students had the opportunity to network with other Midwest members and tour area agricultural engineering companies. In April, we cheered on the Brewers baseball team. At the Annual International Meeting in Spokane, Washington in July, we placed second in the Association of Equipment Manufacturers Trophy Competition. We hosted a game night in September to socialize with our new members. In November we had our Lawn Mower Clinic fundraiser where we winterize push lawn mowers, snow blowers and tillers. This year we serviced 70 machines and put in over 230 hours to raise $2,552.34! Feel free to like us on Facebook to stay up to date with all our events. https://www.facebook.com/asabestudentchapterofuwmadison

We are always looking for industry speakers and places for industry tours. If you know of any opportunities, please do not hesitate to contact our President, Grace Skarlupka(gskarlupka@wisc.edu).



Members and Hydro-Thermal Representatives at our March 2017 member meeting. We are holding their banner for their 29th Annual Wisconsin Manufacturer of the Year award.

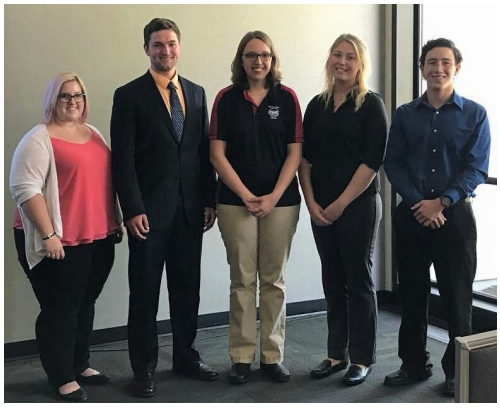
2017 ASABE Officers

President – Grace Skarlupka	**Public Relations** – Jordan Nehls
Vice President – Laura Kramer	**CALS Representative** – Claudia Lopez
Treasurer –Tanner Wears	**Social Chair** – Greg Fehring
Co-Secretaries – Parker Williams, Erin Ochocki	**Engineering Expo Chair** – Jack Jones
Fundraising – Jake Wagner, David Pintens	**AEM Report Chair** – Kyle Winkler

BSE Students Take Home National Awards

BSE students Jared Francois, Melissa Gustafson, Grant Herrman, and Josiah Zanghi took **first place in the 2017 ASABE National Student Design Competition.** The team's hard work on the Hazelnut Shell Fragment and Kernel Separation design won them $1,250 of prize money.

BSE students also took **second place in the 2017 ASABE Association of Equipment Manufacturers Competition and the 2017 ASABE Gunlogson Environmental Design Competition.**



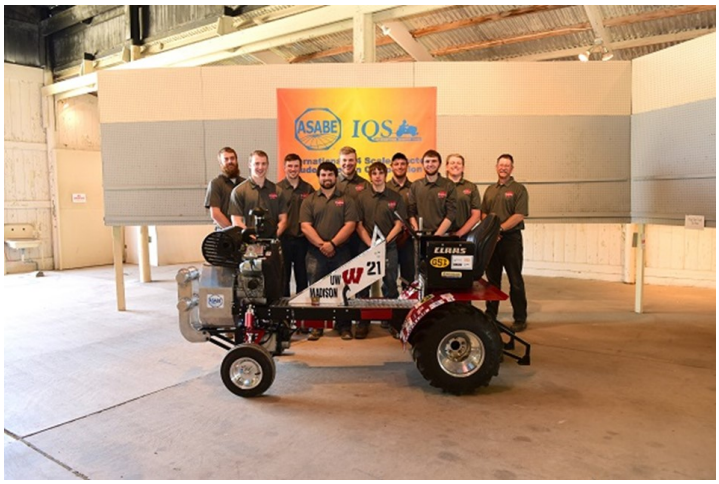
BSE student Grace Skarlupka (center) was **elected President of the ASABE International pre-Professional Community (IPC).** Grace will work with other elected IPC members to plan undergraduate student events for the 2018 ASABE Annual International Meeting.

Quarter Scale Tractor Team

With the 2017 ASABE International Quarter-Scale Tractor Competition completed, we are excited to share our results and experience with you. Thanks to support from our sponsors and advisors as well as many hours of design and fabrication from all of our team members, we finished the tractor and were able to send it to competition.

Last year, your support helped us innovate new designs and reinvent our 2016 design. We switched to a lighter weight two wheel drive tractor. We also redesigned our steering system by implementing an electronically assisted mechanical steering. This year's tractor also featured a new operator's station that features a heads up display that will provide live read outs of speeds and sensors from around the tractor.

Our team members worked hard all year designing and fabricating outside of their busy class schedules. Design iterations were completed by winter and fabrication was the main focus throughout the spring semester. We were very fortunate to have access to the excellent equipment and facilities of the Biological Systems Engineering Department. The equipment available to us, including mills, lathes,



brake presses, shears, welders, and a CNC plasma table allowed us to design for modern manufacturing techniques and gain hands-on fabrication experience.

After our performance last year our team was very excited to redesign a new tractor that could handle the rigorous tests that the competition consists of. Key features of the 2017 tractor included independent front suspension, lightweight two wheel drive design, continuously variable transmission, heads up electronic display and electronic assist steering. Incorporating so many features into a

Continued on page 8.

CALS Departmental Scholarships 2017-2018

Don S. Montgomery Scholarship

Angela Brandl

Daniel Felion

Ervin W. Schroeder BSE Scholarship

Tanner Wears

Gail Edwin & Janice Faye Janssen BSE Fund

Emmett Sexton

Ham Bruhn BSE Scholarship

Carli Peters

Anthony Salituro

Nichole Truby

Noah Boehnen

Huijun Xiao

John Deere Scholarship

Alan Meza

Krutz Scholarship

Noah Boehnen

Orrin I. Berge Scholarship

Eric Peissig

Lynndon & Norma Brooks Scholarship

Joel Cryer

Nathan Dhuey

Grace Skarlupka

Parker Williams

Robert H. & Willa Meier Scholarship

Spencer Hampton

Jenna Pavela

Roger W. Ambrose Scholarship

Jacob Hrebik

Stith Scholarship

Ashaleigh Worrell

Wisconsin Agricultural Engineer Scholarship

Daniel Felion

Claudia Lopez Pineda

Krista Marshall

Lisa Walsh

Wisconsin BSE Scholarship

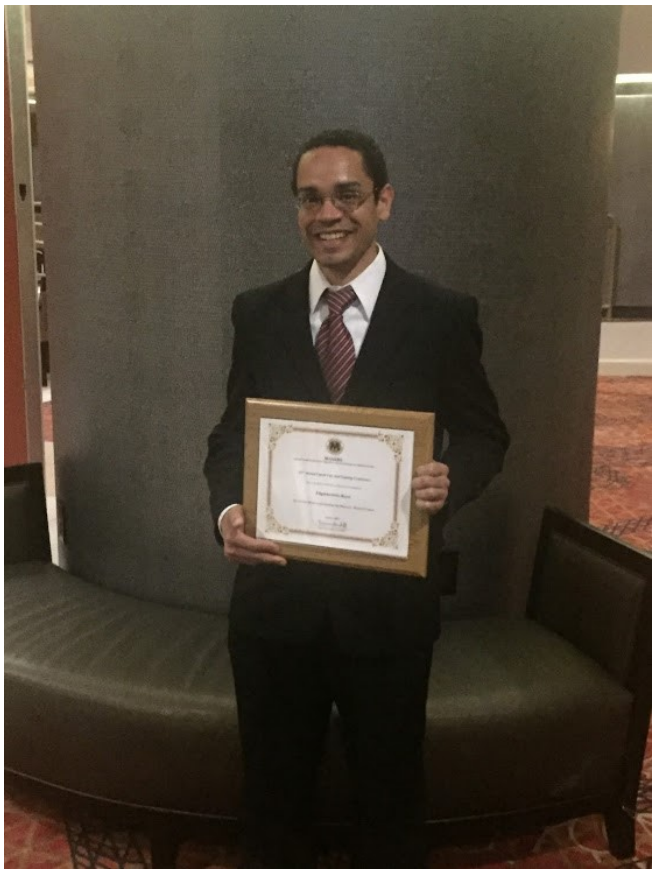
Jordan Nehls

Congratulations to all our scholarship recipients!

Thank you to all the generous donors that support BSE students through scholarships. Your contributions make a huge impact on our students' education.

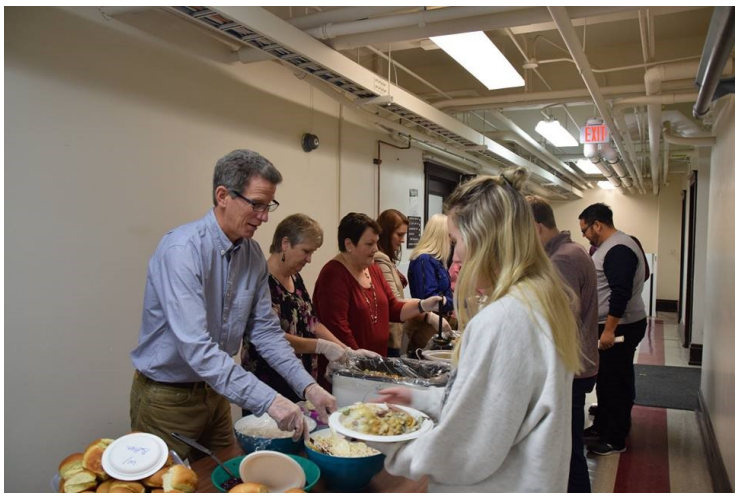
Edgardo Ortiz-Reyes

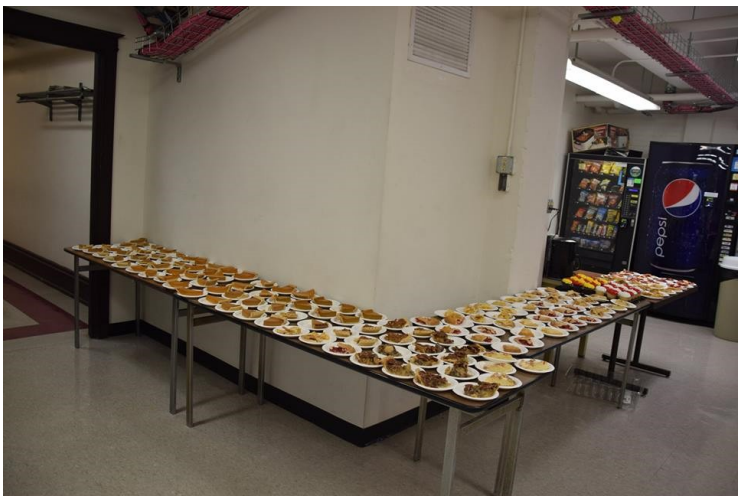
BSE Graduate Claims Research Presentation Award



Edgardo Ortiz-Reyes, who graduated in May 2017 with a Ph.D. from the Department of Biological Systems Engineering (BSE), won the first place award in the research oral presentation contest at the 2017 National Conference of the Minority in Agriculture, Natural Resources, and Related Sciences (MANRRS), which took place in March 2017, at Pittsburgh, PA. Edgardo presented at the MANRRS national conference a study that assessed the environmental performance of the chemical isoprene produced from fermentable carbohydrates compared with that of petroleum-derived isoprene. Isoprene is an important commodity chemical used for the production of synthetic rubber products. This study was part of his dissertation, which was about assessing the environmental consequences and economic feasibility of producing fermentable carbohydrates for the manufacturing of biofuels and bio-based chemicals.

Edgardo joined the BSE department in 2011 and completed his Ph.D. under the advice of Prof. Robert P. Anex.





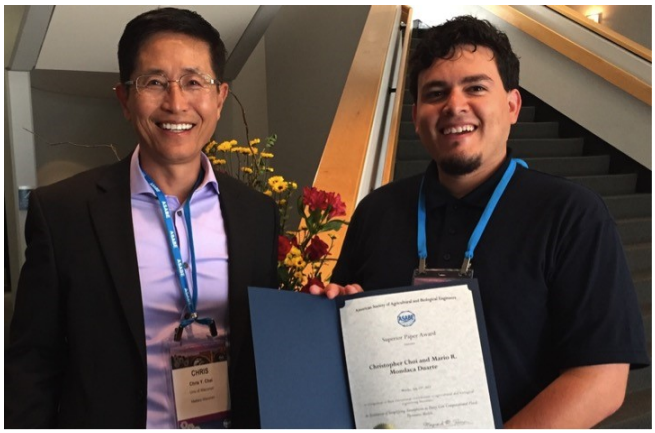
Another successful BSE Thanksgiving in the books! Faculty and staff served over 150 hungry students this year at the annual department event.

BSE Faculty/Staff Win Awards for Scientific Papers, Volunteer Service

Congratulations to Mario Mondaca, Chris Choi and Brian Luck for the Superior Paper Award. Also, Scott Sanford for the recognition of outstanding volunteer efforts to the Energy Systems Community.

The articles published by ASABE in its peer-reviewed journals during 2016 are eligible for 2017 superior paper awards. Each technical community selects up to 5% of the papers published by their community for paper awards based on the articles timeliness, fundamental value, originality and benefits to society, as well as for the quality of writing. Winning paper award authors are presented with a certificate at the Annual International Meeting.

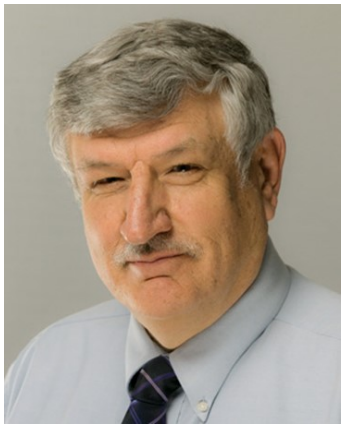
M. Mondaca, C. Y. Choi, "An Evaluation of Simplifying Assumptions in Dairy Cow Computational Fluid Dynamics Models," *Transactions of the ASABE* 59(6): 1575-1584



J. D. Luck, S. A. Shearer, B. D. Luck, M. P. Sama, "Recalibration Methodology to Compensate for Changing Fluid Properties in an Individual Nozzle Direct Injection System," *Transactions of the ASABE* 59(3): 847-859

The Energy Systems technical community (ES) is committed to providing its members with networking and professional development opportunities while recognizing outstanding service to the community. ES leadership is pleased to announce ES Community awards, based on the recommendations of the Awards and Appreciation Committee, an ad hoc committee within ES-100, to the following member - ES-300 Energy Utilization and Applications, Scott Sanford

Richard Straub Wins Prestigious National ASABE Award



This year, our very own Richard Straub was awarded the Evelyn E. Rosentreter Standards Award, which, according to the ASABE website, “Recognizes members who have made exceptional contributions toward the generation, maintenance and administration of ASABE standards. The contributions may be in any aspect of the ASABE standards mission including, but not limited to the development, leadership and service.”

The award honors the service of Evelyn E. Rosentreter, former Administrative Assistant to the ASABE Standards Program. The award was endowed by anonymous donors through the ASABE Foundation, and was first presented in 2000.

Doug Reinemann Named CALS Associate Dean for Outreach and Extension

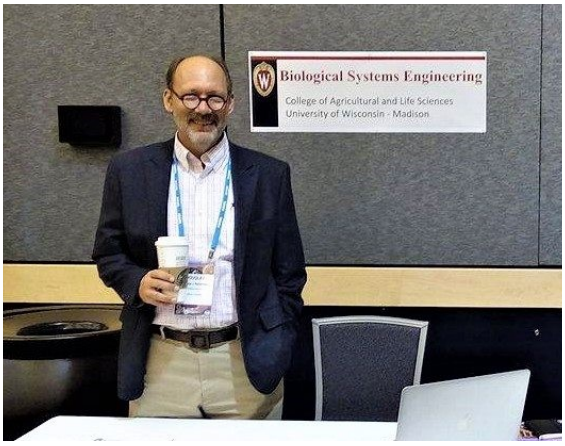
Doug Reinemann, Chair of the Department of Biological Systems Engineering, has been named CALS Associate Dean for Extension and Outreach. In this role, Reinemann will be in charge of the organization, content and effectiveness of the college's Extension and Outreach programs, as well as aligning CALS programs with those of UW-Extension Cooperative Extension.

Reinemann joined the Department of Biological Systems Engineering and Cooperative Extension in 1990. Since then, Reinemann has served as a professor and a UW-Extension milking equipment/energy specialist. His research and outreach experience has largely focused on machine milking systems, rural energy issues, renewable energy technology and sustainable biofuels production.

"Doug comes to the position with experience both in administration from his department chair role and in Extension and Outreach from his years on the faculty. So, he is already starting with a great appreciation of the impact of the college's activities on our many partners outside of the university – and the impact of that engagement on the activities and scholarship of CALS faculty and staff," says Dean Kate VandenBosch.

"This is a time of multiple transitions for Cooperative Extension – the implementation of an internal reorganization, changes to the staffing plan in counties and a return of Cooperative Extension under the roof of UW-Madison," notes VandenBosch.

"Doug's experience will help maintain the strong partnership of Extension with CALS. At the same time, the new CALS-specific focus of this position expands his capacity to provide leadership,



vision and support for college-based outreach efforts."

Outreach has always been an important component of Reinemann's work. Over the years, he has created various Extension programs for industry stakeholders that have been shared broadly. His "MilkTech" programs, for instance, were developed in dialog with industry to meet the needs of milking machine technicians, and these programs continue to be delivered around the state, as well as nationally and internationally.

Reinemann's vision for the future involves a healthy, resilient and responsive approach to Extension and Outreach.

"I'm excited to serve in this position because I understand the important role that Extension and Outreach have played and can continue to play in connecting the university with the people of the state," says Reinemann. "We need to be responsive to immediate needs; answering today's questions. We also need to be forward-looking and working to answer tomorrow's questions as they arise."

He will assume the Associate Dean position on January 1, 2018 and will have an office in Ag Hall.

News From the Chair

(continued from page 1)

We are in the process of selecting a new chair and recruiting a new faculty member in the area of advanced machinery systems. You will hear about the results of these efforts in our next newsletter. The major challenges for BSE in the near term are to first develop a strong staffing plan to not only replace retiring faculty but also add to our faculty numbers to accommodate our growing enrollment, and second improve our teaching and research space to provide an outstanding undergraduate experience, and attract the best and brightest new faculty members and graduate students.

Thanks to your generous contributions in the past, we have started to improve our facilities and space. We have plans for further improvements and need your support to make them a reality. The goal of our fundraising effort as part of the UW-Madison "All Ways Forward" campaign is to update BSE facilities to accommodate the changing teaching and research needs of the department. Our next goal is to create a bigger, better teaching lab space. Our lab courses have increased in size as our undergraduate enrollment has grown. We need to create a larger teaching lab fitted with configurable work stations to accommodate the variety of lab courses offered in the department. This will allow us to continue to offer the kind of high-touch, hands-on experience that our students value. Please consider a donation to the BSE Facilities fund to make this happen (info on the back page).

Quarter Scale Tractor Team

(Continued from page 3)

newly designed chassis took a great amount of time, effort and learning, but we are very proud of what we accomplished with this design at the competition June 2 - 5, 2017.

This year the competition came out with a major rule change eliminating the use of weight and helix type CVT belt transmission options. They also are now allowing skid steering, articulated steering and increased the weight limit 100lbs to an unballasted to-tal of 900lbs.

Throughout the summer, we had made the decision to run a 2WD fully suspended system staying similar to the 2015-2016 tractor of independent front a-arms and a solid 4-link in the rear using the same differential.

With the rule changes coming in the middle of September, we decided to limit the amount of redesign and only alter our driveline. The decision was made to go to a hydrostatic drive system powering into the Po-laris differential in the rear. The hydrostatic system will be controlled electronically with a joystick actuating the swash plate in the pump. Our throttle will also be elec-tronically controlled with a linear actuator.

With these major changes, our members have been working extra hours and have recruited more members to help with design of A-team, rebuild of X-team and when the time comes the manufacturing of the new A-team tractor. Our team has a very positive outlook on this year's tractor and are looking forward to competing for a 1st place trophy in the 2018 Interna-tional Quarter Scale Competition in Peoria, Illinois.

Rebecca 'Becky' Larson

Faculty Profile

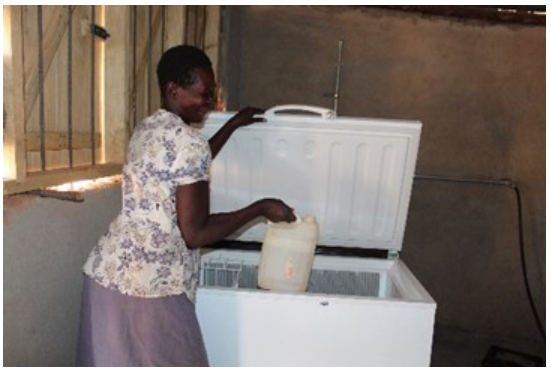
After 7 years on the BSE faculty, Rebecca Larson, affectionately referred to by students and peers as 'Becky', has developed a biowaste program that has tackled many issues in Wisconsin and abroad. Her work has focused on emerging issues in manure management in Wisconsin and abroad.

What are some of the emerging issues you are dealing with in Wisconsin?
One of the most persistent issues in manure management is environmental impacts, particularly during land application. There are continuing issues with runoff and water quality and many emerging issues such as ground-water pathogens and nitrate concerns due to leaching, air quality issues due to pathogens and emissions, and health issues such as risks related to manure gases.

Do you work on manure related issues that wouldn't be classified as emerging?
Yes, while it is important to provide stakeholders with new information on emerging issues, it can be more challenging to try and develop new strategies for issues that have been around for decades. Manure phosphorus runoff and the impact to surface water quality is one of those problems that we continue to face year after year. While we have quantified these issues for quite some time, and have put efforts into conservation strategies, we are not achieving the water quality goals that many would like to see.

Why do we continue to face the same manure phosphorus issues?
While there has been significant effort and success by many partners around the state, changing weather patterns, changes in farming practices and historical buildup of phosphorus continue to put pressure on the system. Plus, once you have reached a point where you are noticing and measuring environmental impacts, it can take a long time to reverse. We are now trying to look past the farmstead and think about managing manure phosphorus on a larger watershed scale and sometimes even at the state level. We are noticing that issues develop where manure production is exceeding crop uptake within a reasonable transport distance from the farmsteads producing it. We are currently developing optimization models to evaluate many phosphorus management techniques in order to help guide where investments should be directed to achieve specific goals and where economic and environmental advantages can be found. In addition, we are working on practical ways to integrate manure phosphorus management on a watershed level in combination with the many other conservation practices and existing work that is ongoing. There are a lot of dedicated people in Wisconsin, including farmers and conservationists, who are working together to try and improve outcomes.

Can you provide us some details with your work in Africa?
Currently, I have been working in Uganda to develop anaerobic diges-
tion systems at an institutional scale, such as schools or small farms. We have installed many systems in which the biogas produced is used to run stoves for cooking. We have measured a reduction in air pollution from wood or charcoal stoves and see improvements in crop yields with application of the digestate (effluent from the digester). One of the most exciting things that is gathering a lot of attention are the biogas refrigerators. They are absorption chillers that can provide cooling, which is particularly useful for keeping valuable food products from rotting, and our end users have been pretty happy with them. We have a lot more work to do, but I am really proud of the progress the team has made in Uganda, they are superstars!



BSE Donors (October 2016 - September 2017)

Individual Donors

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Monette Bebow-Reinhard
Eliot Bergeland
Gerald Bizjak
Ryan Blasiak
David Broten
Gary Bubenzer
Martin Burkhardt
Cally Ehle
Rick Hatlen
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Wells Fargo & Company
Wisconsin Agri-Business Association
Wisconsin Corn Promotion Board Inc

Funding Update

PLEASE CONSIDER MAKING A CONTRIBUTION TO ONE OF THE BSE FUNDS LISTED BELOW:

Biological Systems Engineering Fund

Biological Systems Engineering Student Activities Fund

Biological Systems Engineering Student Scholarship Fund

*The purpose of this fund is to establish and reaffirm a sense of community among the faculty, staff and students of the Department. Uses can include, but are not limited to, receptions and entertainment or costs associated with meals and refreshments. This includes functions related to retirements (excluding retirement gifts), welcome receptions, and any other occasion that the Chair considers to be team or morale building in nature or that allows the Department to function as a productive community."

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; e-mail: barb.mccarthy@supportuw.org).

Department of Biological Systems Engineering Funds

Two options to make a gift:

1.Visit the BSE website at **bse.wisc.edu** and select "**Support BSE**" in the left column.
2.Make checks payable to University of Wisconsin Foundation and return this form to:

University of Wisconsin Foundation
US Bank Lockbox
PO Box 78807
Milwaukee, WI 53278-0807

I/we would like to join other alumni and friends in support of the Department of Biological Systems Engineering.

I/we wish to pledge $_____ over _____ years. Please remind me of my pledge in _____ (month).

I/we contribute $_____. (Contribution is enclosed.) My company will match this gift; company form enclosed.

I/we wish to have my contribution support _____ fund.

Name:_____ E-Mail:_____

Address:_____

City: _____ State: _____ Zip:_____

Please charge my gift of $ _____ to my: MasterCard Visa American Express

Card number ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____Expiration date _____

Cardholder's name as it appears on credit card (please print):_____

Cardholder's Signature:_____ Date _____

The **All Ways Forward** campaign is the fourth comprehensive fundraising campaign in the history of the University of Wisconsin-Madison. With a goal of bringing in $3.2 billion by the end of the decade, it is also the largest campaign in university history.

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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Biological Systems Engineering
UNIVERSITY OF WISCONSIN–MADISON