WINTER 2022

INSIDE:

NDSU AGRICULTURAL AND BIOSYSTEMS ENGINEERING

MESSAGE FROM THE CHAIR

■ ***KENNETH HELLEVANG, Ph.D., PE, interim chair***

Greetings from the NDSU Department of Agricultural and Biosystems Engineering.

There have been or will soon be numerous personnel changes.

Departures and new faculty and staff are listed in this newsletter. With all the flux in staffing, we also have:

• Brian Gregor – Temporary academic faculty, he retired from Doosan Bobcat, and is teaching Engineering Capstone (senior design) and ASM Capstone.

• Elton Solseng – Retired faculty and now temporary academic faculty, he is helping us again during fall semester by teaching ASM 354 - Electricity and Electronic Applications.

• Nadia Delavarpour – A Ph.D. student, she taught ABEN 473 - Agricultural Power during fall semester and will be teaching ABEN 391 - Seminar during spring semester.

The first precision ag major graduated last spring and accepted a job with an excellent salary. There are about 35 students in the major, numerous minors in the program, and the introductory course had about 70 students during fall semester. We have developed a relationship with Titan Machinery, Case IH and other companies to provide support for the program. Research in precision agriculture also continues to grow, with about 18 graduate students.

Enrollment in engineering is about 70 and in ASM is about 35.

Our research productivity has continued during the pandemic. We have about $3.5 million of grant-supported research being done by faculty and about 32 graduate students. We have some information related to our research in this newsletter.

Planning continues for us to vacate our building. Our pilot plant/bioprocessing engineering facilities will be moving into the new Peltier Center (Agricultural Products Development Center), our lab/shop/fabrication facilities will be moving to the Pilot Plant, and offices and some laboratory and teaching facilities will move

continued on next page

Faculty and staff

Faculty
Kenneth J. Hellevang
Igathinathane Cannayen
Sulaymon Eshkabilov
J. Paulo Flores
Ademola Hammed
Xinhua Jia
Zhulu Lin
Ewumbua Monono
Matthew Olhoft
Thomas Scherer
Dean Steele
Xin (Rex) Sun
Yu (Heather) Zhang

Adjunct faculty
Thomas A. Bon
Brian Gregor
John Nowatzki
Elton Solseng

Postdoctoral research associates
Mohammed Raju Ahmed
Cengiz Koparann
John Stenger

Support staff
Ademola Ajayi-Banji
Julie Bietz
Jana Daeuber
Susan Finneseth
Kenton Jensen
Tayler Johnston
Dongqing Lin
Niloy Sarker
Sheldon Tuscherer

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MESSAGE FROM THE CHAIR

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into Ladd Hall. The schedule is still for Sugihara Hall (new science building) to be completed and everything moved into the building by early 2022. Ladd Hall will be renovated during 2022, with ABEN moving in 2023. The ABEN building is to be demolished, since it is not disability accessible and is considered too expensive to maintain and bring into compliance.

Dr. Leon Schumacher will be starting as the new chair of the department on Jan. 3, 2022. He has been the program coordinator of the agricultural systems management program at the University of Missouri, Columbia, for 15 years. Dr. Schumacher has been recognized for his excellence in teaching and advising students. His research has included energy conservation and the use of biofuels for diesel engines. His current research focuses on "smart farms" of the future.

After serving three years as interim department chair, I will be going back to my role as Extension engineer, providing education and technical assistance on grain drying and storage; structures, with a focus on energy efficiency; indoor environmental engineering, primarily related to moisture and mold; and disasters, including flood preparation and recovery.

It has been an interesting and challenging three years. Some of the major efforts have been related to starting the precision agriculture academic and research programs; review of the curricula in the three degree programs; enhancements in student recruitment (postcards were sent to high schools in the region, enhanced social media and department news articles); development of a department strategic plan; development of a facilities tour that is on our website; improvements in facilities; enhanced public relations efforts; planning for the moves to new campus locations; and major changes in faculty and staff.

In this issue of our newsletter, please read about the many student activities, including senior projects and the Ag Tech Expo. The many scholarships received by the students are listed in this newsletter also. Thank you to the many donors whose generosity makes this possible. ■

Faculty and staff announcements

Departures:

• **John Nowatzki** – Extension machinery systems specialist, retired on March 1. A search for his replacement was not successful. Another search is planned for early 2022.

• **Dr. Thomas Bon** – Professor of practice, retired this past summer, but will continue to teach ABEN/ME 479 - Fluid Power Systems Design.

• **Dr. Halis Simsek** – Assistant professor, left NDSU for Purdue University in June.

• **Dr. Shafiqur Rahman** – Professor, left NDSU in August to become a division director at U.S. Department of Agriculture National Institute of Food and Agriculture (NIFA) in Kansas City, Mo.

• **Dr. Zhao Zhang** – Research assistant professor, left NDSU in August and returned to China.

• **Melanie Ziegler** – Administrative assistant, retired Dec. 1.

• **Dr. Nurun Nahar** – Assistant professor of practice, left NDSU in December, also for a position with USDA NIFA in Kansas City, Mo.

New faculty and staff:

• **Dr. Ademola Ajayi-Banji** – Research specialist, started in April.

• **Susan Finneseth** – Grants coordinator, also started in April. She is providing support for ABEN and two other departments.

• **Tayler Johnston** – Fabrication technician and maintenance mechanic, started the end of November.

• **Dr. Sulaymon Eshkabilov** – Assistant professor, starts the end of December and will be teaching ABEN 478 - Machinery Analysis and Design and ABEN 482 - Instrumentation and Measurements during spring semester. ■

ABEN

NDSU AGRICULTURAL AND BIOSYSTEMS ENGINEERING

Internships

In an internship or co-op education program, students gain valuable work experiences that complement each semester at NDSU. Internship programs provide financial benefits while in college, increased employment opportunities, and higher starting salaries. Internships are often scheduled during the sophomore, junior and senior year.

Students should contact Julie Bietz, student coordinator, at julie.bietz@ndsu.edu; the Cooperative Education Office (Ceres 306); or their student advisor if they are interested in an internship program. More information is also available at: www.ndsu.edu/aben/internships.

"My academic program and coursework had a big impact on preparation for my internship. I find myself using many principles and concepts that I learned in previous classes at my internship to solve challenges and engineering problems."

– Chase Bader

MAJOR: *NDSU Agricultural and Biosystems Engineering*

INTERNSHIP: *Amity Technology LLC*

3D printing class first of its kind at NDSU

A course focusing on 3D printing was offered for the first time this fall through the Department of Agricultural and Biosystems Engineering at North Dakota State University (NDSU).

The course is now in the final stages of approval to become a permanent course, to be offered as Ag Systems Management 234, "3D Printing and Manufacturing."

It was new in the fall semester as a trial course in the Ag Systems Management curriculum. Seventeen of the available 20 seats were filled for the first class, which is taught by Matthew Olhoft, a senior lecturer in the Department of Agricultural and Biosystems Engineering. This is the first course at NDSU dedicated solely to 3D printing. The department has seven 3D printers available to students. Olhoft has been involved with 3D printing for several years and recently attended a major conference on additive manufacturing.

"There is a need for our young engineers coming out of NDSU to be more aware of what they can do with additive manufacturing. More and more companies are switching over to additive manufacturing versus subtractive manufacturing, which is the milling of things like parts," he said. "There's just a lot more flexibility and the cost factors tend to be a lot cheaper, especially for producing prototype parts, with additive manufacturing."

The class starts with a brief history of 3D printing, then moves into the different types of 3D printing and the different materials that can be used. It then explores the process of printing, from designing a project to printing the product. The class toured the manufacturing facilities of LulzBot in Fargo and Fargo 3D-Fuel, which manufactures filament. The president of LulzBot is a graduate of the Agricultural and Biosystems Engineering Department. Laser-etching and cutting and 3D scanning were also covered during the course.

A poll of the current class showed about half have 3D printed something before, while half are new at it, Olhoft said.

"3D printing is starting to get pervasive in our society in all kinds of levels. In the not-too-distant future, a lot of the parts that you need for machines will probably come to you via the internet. You'll purchase an STL file and then you'll actually print the part at your location or a local business," Olhoft said. A farmer, for example, could go to a local supplier who will receive the file and print the part the same day, he pointed out.

Students in the new course through the Department of Agricultural and Biosystems Engineering at North Dakota State University (NDSU) tour LulzBot in Fargo, where a print farm creates parts for the new 3D printers.

"Engineering students need to know what options are available, especially when it comes to materials they work with," he said. "What materials can you use to create a part? It's very easy to have a 3D printer available and be able to print something immediately and have your hands on it in a material that's going to be an end-use product right off the printer." ■

The world in 3D

NDSU alum goes 3D with ABEN degree

John Olhoft, who received his Bachelor of Science degree in agricultural and biosystems engineering from North Dakota State University (NDSU), is at the epicenter of the 3D printing universe.

As president of Fargo's LulzBot and its parent company, FAME 3D, his NDSU degree has been indispensable.

"The engineering degrees at NDSU prepare you to be a professional problem-solver," he says. "It doesn't matter what the issue is, you're able to take all of the given information, assess what you're trying to find out, then develop a solution."

Those steps are fundamental, he says, in any engineering career.

"When we're designing, developing and deciding if what we're making is a good idea, or if we're vetting a supplier or a decision on material choices, that technical background is invaluable. It provides me with the ability to interpret what I'm faced with, take a technical approach and use that to say if this is possible or if it's a bit far-fetched," he says.

Olhoft, who graduated from NDSU in 2017 and is now pursuing an MBA, knew little about 3D printing in college, until a fraternity friend utilized a homemade 3D printer to replicate a miniature boat.

"And my mind was blown," Olhoft says. "The next day, I went over to Fargo 3D Printing and I said, 'You're hiring me. I need to learn more about this.'"

He worked part time at the company fixing 3D printers, but took a winding path back into the industry after college.

"I always had a knack for engineering and machinery. I came from a small town in rural Minnesota and I guess I enjoyed working on those machines, so when it came time for my professional education, that's what I decided to pursue," he says about his degree in agricultural and biosystems engineering.

John Olhoft, who received his Bachelor of Science degree in agricultural and biosystems engineering from North Dakota State University (NDSU), is now the president of Fargo's LulzBot and its parent company, FAME 3D.

He interned for Cargill during college, working across the United States, then took a job in the food production industry upon graduation before later returning to Fargo.

"On the surface, it doesn't seem like it fits in with 3D printing and what we do now, but it is actually closer than you might think," he says. "Most of these large production plants actually use a large amount of programmable logic controls or PLCs, so it's very similar in that sense to the 3D printers that we manufacture."

He started his first company in 3D printing, Fargo 3D Printer Repair, in 2018 with his father and NDSU senior lecturer, Matt Olhoft.

Located in Fargo, LulzBot is the largest manufacturer of desktop 3D printers in the United States.

In November 2019, John and two partners, Cooper Bierscheid and Ron Bergan, formed FAME 3D to purchase the LulzBot brand's assets.

They packed those assets on 28 semis in Loveland, Colo., and moved the company to Fargo, opening in the new location Jan. 1, 2020, and building the first 3D printer two weeks later.

"At this point, we are the biggest and one of the only desktop 3D printer manufacturers in the U.S.," John says.

The company has five different model lines: Mini 2, TAZ SideKick, TAZ Workhorse and TAZ Pro, along with the LulzBot Bio that replicates organic matter such as soft tissue for medical purposes.

"This past July, we launched a brand new printer that is 100% Fargo-designed, Fargo-built. We do all business operations here in Fargo," John says. "Our newest model is interesting, because it's the most affordable printer we've ever made, so we're hoping for a lot higher volume on that line."

With just over 75 employees, LulzBot utilizes an onsite print farm with 300 printers to manufacture many of its own parts to build its printers.

The company has 500 line items that it 3D prints for its own manufacturing process. LulzBot can create about 50% of its 3D printers by manufacturing its own parts, which illustrates the benefits of 3D printing.

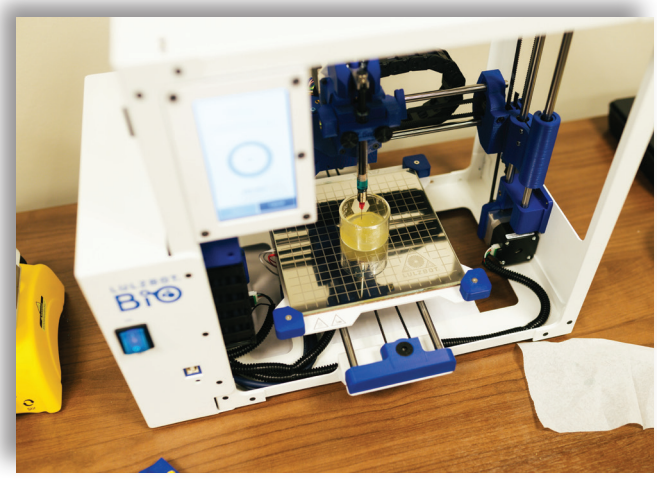
Under the FAME 3D umbrella now rests LulzBot, Fargo 3D Printer Repair and Protosthetics, which 3D prints prosthesis and orthotics, working with clinics to scan an amputee's limb and produce molds or a final piece for a more accurate organic shape.

With those types of applications, the world of 3D printing is endless, John points out.

"I think it's set for some pretty explosive growth yet again. During COVID, you saw the need to make a lot of things fast. People illustrated their 3D printers could be used in that manner. We're also entering a time where there's a lot of supply chain shortages and the one thing we haven't had to do is slow down," John says.

"If I was relying on a network of 30-some vendors to get those 500 different parts, I would be very nervous right now. As long as I have raw plastic, I can turn it into whatever I want," he says. "That is an invaluable tool that I think manufacturers will continue to see the value of, especially in times of supply chain uncertainty, if they know they can make it in-house."

LulzBot's clients include universities, schools, the military, hospitals and large manufacturers, such as Tesla, John Deere and Ford, as well as hobbyists.



The LulzBot Bio replicates organic matter such as soft tissue for medical purposes.

At a the cornerstone of 3D printing, John points to only one other place in the world, in China, where 3D printing is as pervasive as in Fargo.

And Fargo has been welcoming, he says.

"It is very welcoming to entrepreneurship," he says. "North Dakota's been a good state to do a business in. … In Fargo, it's very easy to contact people. Somebody knows somebody. It has more of a small-town feel."

And it all started at NDSU.

"It's been a pretty adventuresome journey," John says. ■

Wearing No. 70, Cody Mauch is an offensive lineman for the NDSU Bison football team.

Student-athlete tackles ABEN degree

With his long, auburn hair and 6'6" frame, Cody Mauch is probably recognizable on the North Dakota State University (NDSU) campus – and the football field.

An offensive tackle for the NDSU Bison football team, Cody wears No. 70 on the field. Off the field, he's earning a Bachelor of Science degree in agricultural and biosystems engineering from NDSU.

As a student-athlete, juggling the weightroom and the classroom has been a challenge, but Cody has found support across the entire campus, from professors, advisors, coaches, teammates, classmates and the Student Success Programs.

The son of Joseph and Stacey Mauch, Cody graduated from Hankinson High School in 2017 and is a fifth-year senior at NDSU, with plans to return to the family farm with his degree in hand.

He appreciates the ability to combine both agriculture and engineering into one degree.

"I grew up on a farm and I had a teacher in high school talk to us about the engineering field and that kind of interested me, but I knew I wanted to do something with farming. Then, I found out about ag engineering and I thought that would allow for a little bit of both," he said.

"I'll take what I've learned from school and hopefully help on the farm with that," he said. "But this is also a good degree if farming doesn't work out."

The family farm is located just outside of Mantador and raises corn, soybeans, edible beans and sugar beets, and does custom baling.

Cody was a standout athlete in high school, arriving at NDSU as a preferred walk-on tight end, then transitioning to offensive tackle. He has been a part of the Bison winning tradition, playing as part of three NCAA Division I FCS national championship teams.

While those championships are the golden goal, Cody understands the classroom is the priority.

"A lot of people could get caught up in just worrying about their

sport, but the reason you're here is to get a degree, so you want to make sure you do well in school, while also doing as well as you can in your sport," he said. "So, the challenge is to balance athletics and academics."

The athlete's days are a blur of lifting weights, watching film, two-hour practices, meetings, weekend games, attending class and homework.

"You have to get in the mood to do school, then you have to get in the mood to do football. You have to lock your brain into what you're doing," he said.

Communication with professors is paramount, but they are understanding of his schedule, he says, and academic advisors within the department are knowledgeable – and they like to visit about football, too, Cody said.

"I've found friends on my football team, but I've made pretty good friends within my department."

- Cody Mauch

Within the Student Success Programs, the Athletic Academics staff provides academic support for student-athletes, making sure they are on track to graduate and achieve their academic goals.

Student-athletes must meet not only NDSU requirements, but also NCAA requirements, explains Kelli Layman, director of Athletic Academics.

Students must make a percentage toward their degree every year they are in school. As a freshman, for example, they must have 24 degree-applicable credits. At the end of their fourth year, they must be at 80% of their applicable credits and must graduate within five years. Athletes must also be full-time students at all times and maintain their required grade point average.

"It's just so much more restrictive, so we really watch that," Layman said. "There isn't a day that goes by that we don't check where they're at."

The office also guides student-athletes to any other resources they may need.

"We're kind of a triage office. We help them with whatever they need whenever they need it," Layman said. "Having somebody there for the student-athletes is reassuring. Even though they may not always need us, they know they can come in."

All of the NDSU athletic teams are above a 3.0 in average grade point average, Layman said.

"That speaks volumes for the type of kids we have here, and Cody is one of them. He's a great kid," Layman said.

Four staff members work with more than 450 student-athletes.

A fifth-year senior, Cody Mauch intends to return to his family farm with his ABEN degree.

"Their freshman year, they're just trying to keep their head above water academically as well as football, trying to manage all that," Layman said, so the department helps the student-athletes understand balance.

Cody echoes that, pointing to his own freshman year when he learned about time management and the rigors of the longer football season.

"Try to make friends as soon as you can. I've found friends on my football team, but I've made pretty good friends within my department. I think working with other students on schoolwork helps a lot. I wish I would have done that a year or two sooner," he said.

And he encourages others to consider the agricultural and biosystems engineering degree.

"If you are into engineering and are interested in something with a little ag background, it's pretty cool," he said.

"I've made a lot of really good friends and I've learned a lot of good lessons," he said. ■

Department research projects summarized

Our department research is grouped into three primary categories: Precision Agriculture and Machinery, Natural Resources and Bioprocessing Engineering. We currently have about 32 graduate students conducting research directed by the faculty. The research is almost entirely supported by competitive grants or contracts. Following are some report and journal article titles from the research projects:

Natural Resources

• Estimating the water quality impact due to drainage water management, with nutrient load reduced, but salinity-related chemicals increased.

• Using soil moisture sensors to automatically control the irrigation time and amount to conserve water resource, and provide optimal moisture status for crops.

• Infiltration into frozen silty clay loam soil with different soil water contents in the Red River of the North Basin.

Bioenvironmental Engineering

• Comparison of the reactor performance of alkaline-pretreated corn stover co-digested with dairy manure under solid-state.

• Comparative techno economic analysis of bioethanol production from loose and pelleted corn stover following soaking in aqueous ammonia pre-treatment.

• Kinetic studies of alkaline-pretreated corn stover co-digested with upset dairy manure under solid-state.

• Impact of corn stover particNETIle size and C/N ratio on reactor performance in solid-state anaerobic co-digestion with dairy manure.

Bioprocessing Engineering

• Evaluating inoculation methods to infect sugar beet with Fusarium oxysporum F. Sp. betae and F. secorum.

• Hyperspectral imaging techniques to examine nutrient status of hydroponically grown lettuce cultivars.

• Optimization of browning index of Maillard reaction in gelatin powder by response surface methodology (RSM) for halal authentication.

• Isolation of hyper-ammonia-producing bacteria for organic ammonia production from soybean crop and byproducts.

• Unlocking the potential of minimally processed corn germ oil and high oleic soybean oil to prepare oleogels for bakery application.

• Blessed thistle a promising species on North Dakota marginal lands: agronomic productivity, oil properties and biodiesel potential.

• Physical properties and cookie-making performance of oleogels prepared with crude and refined soybean oil.

• Production and characterization of epoxidized sucrose and maltose ester of corn oil.

• Optimizing hempseed oil degumming and bleaching processes.

• Compare the effect of soybean variety selection on the quality of texturized vegetable protein.

• Evaluating the allowable storage time of two soybean varieties at four moisture levels at typical storage temperatures.

• Biochemical synthesis of corn-based biomaterials for making edible bale net wrap.

• Development of an RF-sensing platform for grain detection.

Precision Agriculture

• Collaborating with plant breeding programs at NDSU to explore the implementation of high throughput phenotyping approaches for selected crops on different environments (lab, greenhouse and field research plots), and developing a multispectral image collection system over a conveyor to collect images from a large number of plants and trays in the greenhouse. Also, working with the NDSU potato breeder to implement a high throughput approach to collect potato tuber measurements and to assess disease development on tubers.

• Distinguishing volunteer corn from soybean at seedling stage using images and machine learning.

• Wheat lodging detection from UAS imagery using machine learning algorithms.

• Building NRCS technical capacity in irrigation water management for variable rate irrigation.

• Using UAS for site-specific weed management in corn.

• Using UAS for high throughput phenotyping on dry beans.

• Using UAS for site specific weed control in corn.

• Combining harvester, in-field protein data, equipment data and UAS to map protein and oil variability on the landscape for selected crops and to improve crop management.

• Applications of UAS to collect physiological and phenological data from crops growing on small research plots.

• Technology progress in mechanical harvest of fresh market apples.

• Prediction of whole pork loin and individual chops intramuscular fat using computer vision system technology.

• Evaluation of beef cattle temperament using video processing technology.

• Effect of feeding a low-vitamin A diet on carcass and production characteristics of steers with a high or low propensity for marbling.

• Progress and development on biological information of crop phenotype research applied to real-time variable-rate fertilization.

• Identify weed species using deep learning artificial intelligence technology.

• Using mid-season vegetation indices from drone imagery to predict wheat and corn yield under different nitrogen treatment.

• Palmer amaranth (Amaranthus Palmeri s. Watson) identification using hyperspectral imaging technology.

• Using TensorFlow deep learning neural network and artificial intelligence technologies to classify beef cuts.

• Distinguishing seedling volunteer corn from soybean through greenhouse color, color-infrared and fused images using machine and deep learning.

• Distinguishing volunteer corn from soybean at seedling stage using visible light images coupled with machine learning algorithms.

• Technology progress in mechanical harvest of fresh market apples.

• Wheat lodging detection from UAS imagery using machine learning algorithms.

• Wireless positioning and path tracking for the mobile production vehicle in greenhouse. ■

2021 Agricultural Technology Exposition results

Our students participated in the Agricultural Technology Expo in February 2021. The Expo gives our students an opportunity to showcase their knowledge by presenting projects dealing with technology and agriculture.

While this year's event was completely virtual, the 2022 event will be in-person again.

Grand Champion: Gabe Specht
Project: "Batteries Powering the Future"

Reserve Champion: Wilson Howard, Shad Mack, Brady Serie
Project: "Oxboe Olive Harvester"

People's Choice: Dakota Wolfe
Project: "Drone Applications for Farmers"

Senior Design Champion: Carter Weiser, Cody Henne, Cody Mauch, Bryce Saiger
Project: "Multifunction Precision Ag Robotic Platform Structure"

Freshman Champion: Daryn Yntykbay
Project: "Vertical Farming"

Machinery Division Champion: Wilson Howard, Shad Mack, Brady Serie
Project: "Oxboe Olive Harvester"

Machinery Division Second Place: Justin Hoffmann
Project: "Summers Variable Rate Tillage Tools"

Machinery Division Third Place:
Ganon Kuznia, Brent Solheid
Project: "Methane-Powered Tractors"

Soil Water and Environment Champion:
Shannon Mcbride, Ashley Jansen
Project: "Closed-Loop Anaerobic Respirator"

Soil Water and Environment Second Place:
Daryn Yntykbay
Project: "Vertical Farming"

Structures, Energy and Processing Champion:
Gabe Specht
Project: "Batteries Powering the Future"

Structures, Energy and Processing Second Place:
Lochlan Baird
Project: "MW Sterilization of Cereal Grain"

Precision Ag Champion: Jonah Steffl, Maison Zimmer
Project: "Crop Spraying Drones"

Precision Ag Second Place: Dakota Wolfe
Project: "Drone Applications for Farmers"

Precision Ag Third Place: Tyler Voightman
Project: "Yield Mapping" ■

Scholarship winners

Scholarship	Major	Recipient
College of Engineering		
Ernie French	ABEN	Kate Wrolson
Lawrance & Elizabeth Shaw	ABEN	Jared Mattis
Lawrance & Elizabeth Shaw	ABEN	Chase Bader
Lawrance & Elizabeth Shaw	ABEN	Caleb Weinand
Thoreson Engineering	ABEN	Justin Lester
Thoreson Engineering	ABEN	Maribel Vargas-Aguilar
Brian & Debra Houkom	ABEN	Gabriel Beaver
College of Agriculture, Food Systems and Natural Resources		
Vernon Lee	ASM	Matthew Asche
Vernon Lee	ASM	Isaac Huber
Elton Solseng	ASM	Aaron Kalthoff
ABEN/ASM or PAG		
A.R. Bon Memorial	ASM	Anna Muggli
E.L. Bon Memorial	ASM	Joe Ellison
E.L. Bon Memorial	ABEN	Alex Radermacher
F.A. Bon Memorial	ABEN	Seth Kjellberg
M. Bon Memorial	ABEN	Preston Wilson
M. Bon Memorial	PAG	Jonah Steffl
Clarence & Irene Becker	PAG	Annika Christensen
Scott and Mary Handy	ABEN	Maison Zimmer
Walter and Pearl Nyquist	ASM	Kordell Myers
Bill & Ann Promersberger	ABEN	Wilson Howard
Dr. George & Patti (Jones) Pratt	ABEN	Maison Zimmer
Marvin and Doris Jensen	GRAD	Uday Prakash Vaddevolu
Lundstrom Family	PAG	John Haverland
Earl & Dotty Stegman	ASM	Hunter Frederick
ABEN Dept. Scholarship	PAG	Gabriel Avenson
ABEN Dept. Scholarship	ASM	Joseph Sorenson
ABEN Dept. Scholarship	ASM	Luke Matyas
ABEN Dept. Scholarship	ASM	Melanie Hansen
ABEN Dept. Scholarship	ASM	Adam Dietz
ABEN Dept. Scholarship	ABEN	Mya Vogel
ABEN Dept. Scholarship	ABEN	Johnathan Suchy
ABEN Dept. Scholarship	ABEN	Ryan Doe
ABEN Dept. Scholarship	ABEN	Shianne Boehm
ABEN Dept. Scholarship	PAG	Jacob Vogt
ABEN Dept. Scholarship	PAG	Eric Meredith
ABEN Dept. Scholarship	ASM	Ashley Jansen
ABEN Dept. Scholarship	ABEN	Daryn Yntykbay
ABEN Graduate Student		
Frank Bain Agricultural Scholarship	GRAD	Sunil GC
Frank Bain Agricultural Scholarship	GRAD	John Mayer
Frank Bain Agricultural Scholarship	GRAD	Breeya Pederson

Student clubs and officers

Agricultural Systems Management

Office	*Name*
President	Phillip Steffan
Vice president	Cole Rasmusson
Secretary	Harlee Gunning
Treasurer	Hunter Frederick
CSO representatives	Benjamin Schiller, Nicholas Rudnik
Advisor	Matt Olhoft

ABEN Robotics

Office	*Name*
President	Billy Ram
Advisors	Yu (Heather) Zhang, Cengiz Koparan

Bison Pullers/Quarter Scale Tractor

Office	*Name*
President	Ryan Kasper
Vice president	Aaron Kalthoff
Secretary	Robert Stephany
Treasurer	Spencer Rosar
Advisors	Matt Olhoft, Brian Gregor, Heather Zhang

Alpha Epsilon

Office	*Name*
President	Nadia Delavarpour
Vice president	Ranjan Sapkota
Secretary	Justin Lester
Treasurer	Danika Tweten
Peer Mentor Program Coord.	Scott Folz
Advisor	Xinhua Jia

Precision Ag

Office	*Name*
President	Jonah Steffl
Vice president	Tristen Uglem
Advisor	Rex Sun

ABEN Graduate Students Association

Office	*Name*
President	Nitin Rai
Vice president	Uday Bhanu Prakash Vaddevolu
Secretary	Shashi Bhushan
Treasurer	Nadia Delavarpour
Public relations	Franklin Odili
Advisor	Xinhua Jia

WELCOME

Welcome to the annual newsletter of the Department of Agricultural and Biosystems Engineering.

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Why donate?

For a program to stay current and relevant, our labs need to be continually updated to current technology. ABEN has been proactively updating our teaching labs, and your support is critical.

Your contributions are also used to sponsor scholarships for Ag Tech Expo, recruiting, and other teaching and student activities.

Lots of exciting things are happening at ABEN, and your contributions play a vital part in supporting ABEN activities. Thank you for your support of our great department!

Alumni contributions welcome!

Enclosed is my tax-deductible check, payable to:
NDSU Foundation & Alumni Association, with a memo indicating ABEN, in the amount of:

_____ $25
_____ $50
_____ $100
_____ $500
_____ $1,000
$_____ Other

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