FOREWORD

It’s just the opposite. Our theme for this issue of STORIES refers to the scale in which selected scientific and educational efforts are underway, not the impact the projects are making.

As Basil Nikolau says in his Voices essay on page 14, “Iowa State University researchers are looking for discoveries in small plots, in small organisms or in small molecules, which will uncover advances and provide the foundation for major scientific breakthroughs.” Nikolau is the Frances M. Craig Professor of Biochemistry in the Roy J. Carver Department of Biochemistry, Biophysics and Molecular Biology, a department co-administered by our college and the College of Liberal Arts and Sciences. The collaborative nature of Nikolau’s work and his explanation of “small science” illustrates three other factors which could have easily been used in the title of this issue: Collaboration. Innovation. Relevance.

Collaboration. The work of Ashvesh Singh and Kevin Falk in agronomy focuses on the small but mighty root system of soybeans. It’s a great example of the collaborative nature of the research featured in this issue. Together with plant pathologists, breeders, geneticists, engineers and computer and data scientists they are gaining better understanding of soybean roots and the important microbial community surrounding them. Their results could help improve profitability.

Innovation. Alumna Diane Young built a hub for the latest testing technology in her corner of rural Iowa. The company attracts top talent to test everything from food products to regulatory water samples to co-products from the ethanol industry.

Relevance. Animal scientist Josh Selby’s research on muscular structure, proteins in muscle and how muscles work may someday help boys with Duchenne muscular dystrophy preserve muscle and live longer. CALS grad Rob Stout’s efforts to improve soil health—cover crops, a bioreactor, prairie strips and more—are managing nutrients and reducing run-off in his watershed and downstream.

You’ll also read about faculty, students and staff making impacts—big and small—in the lives of students and Iowans and tackling tough issues with global significance.

In closing, I hope you’ll make plans to attend the College of Agriculture and Life Sciences celebration at the Cyclone women’s basketball game and reception February 10, 2018. We’ll be hosting a complimentary pre-game party and will recognize the 2018 CALS Emerging Iowa Leader. Watch STORIES Online for registration details. If you’re not receiving your monthly e-news from the college in STORIES Online, e-mail eooffice@iastate.edu to subscribe.

Nikolaas Rijkers Licht

Kind regards from central campus,

Nikolaas Rijkers Licht
When you open this issue of STORIES, I will have spent the first few weeks in my new job as president of the best land-grant university in the country.

Since the October 23 announcement of my selection as the 16th president of Iowa State University, I’ve received hundreds of messages from alumni and friends. Thank you to those who took the time to send notes of congratulations and best wishes. Your thoughtfulness meant a lot to me.

I will do my very best to make you proud to be alumni of Iowa State University, and of this great College of Agriculture and Life Sciences. I know that Joe Colletti, the interim dean of the college, will continue our momentum into the future and leading into a national search for a new dean.

Since October 23, more than once I’ve found myself thinking about the “story of two Rogers,” a tale that’s been told in the College of Agriculture and Life Sciences for over 30 years.

Roger Bruene (’56, agronomy) served as the college’s placement officer from 1975 to 1998, and a total of 40 years as a dedicated Iowa State employee. Roger Underwood (’80 agricultural business) was the ringleader of a group of alumni who, over several years, sent Roger Bruene a stream of tributes from around the world. The notes were jotted on postcards, letters, photos, napkins, airsickness bags—any surface that could hold ink. One was even rolled up and put in a wine bottle.

All the notes contained the same message: “I love my job!” That is the message I want to share with you now. I love my job. I have loved every job I’ve had at Iowa State University, from working with farmers as an extension integrated pest management specialist to serving as Endowed Dean of one of the very best agricultural colleges in the world.

My next chapter of service to this great university has begun. In every chapter, I have served joyfully and with optimism for what the future holds. Please stay connected. I welcome your input and continued support as we move the university forward.

Wendy Wintersteen
President, Iowa State University
Endowed Dean of Agriculture and Life Sciences 2006-2017

STORIES Vol.11 No.2

BY THE NUMBERS

CALS STUDENTS

5,333 students, both undergraduate and graduate (62 fewer than Fall 2016)

4,603 undergraduates

730 graduate students

WOMEN

51

MEN

49

62 students, higher than 10 years ago

495—Record number of U.S. multicultural students (self-reported). 10% increase over 10 years ago

3RD largest undergraduate student body among agricultural colleges in the nation

EXTERNAL DOLLARS

$51.5 million raised last year

$271+ million over past 5 years

FOREVER TRUE: INVESTING IN EXCELLENCE

• $31 million raised last year

• 4,500+ alumni, friends and supporters provided gifts

• $15M gifts to feed mill and grain science center
  • Kent Corporation, $5 million
  • Iowa Corn Promotion Board, $4 million
  • Sukup Manufacturing Company, $2 million

• $15M gift from the Roger and Connie Underwood Family Foundation to support ag entrepreneurship and ag business programs

• Kemin Food Science Laboratory renovation
  • Mary A. Kelleher Nelson and R.W. Nelson
  • Kemin Industries

BUILDING PROFESSIONALS

1,160 bachelor of science degrees awarded last year. 62% more than 5 years ago

98% grade placed within 6 months of graduation

ALMANACLETTER FROM THE PRESIDENT
MAIZE ON MARS

MAKING “THE MARTIAN” A REALITY

Surrounded by a red rocky surface as far as the eye can see, you look up and gaze at the planet Earth in the distance. Your stomach growls and you realize it is time for dinner. Heading back to your colony, you harvest some corn from your garden and prepare to eat it.

Hoefler’s research tested the effects of radiation levels on corn, a plant that might one day be grown in a Mars colony. Her project involved exposing corn seedlings to radiation levels similar to what would be found on Mars.

In the movie, based on the book “The Martian,” a man is left behind on Mars after a space mission. The only way he thinks growing food to sustain life on Mars comes to mind,” Hoefler says. “It also is interesting that our own ozone is depleting, so Earth may one day become more Martian-like. So we’re seeing if plant growth under these conditions is possible.

The corn plants were exposed to both ultraviolet and x-ray irradiation. Hoefler administered UV radiation by using a germicidal lamp in the lab. The X-rays took place at the Mary Greeley Medical Center with a linear accelerator, which is used to provide radiation treatments to cancer patients.

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In the movie, based on the book “The Martian,” a man is left behind on Mars after a space mission. The only way he can survive is to cultivate potatoes.

“When people think of NASA, I don’t think growing food to sustain life on Mars comes to mind,” Hoefler says. “It also is interesting that our own ozone is depleting, so Earth may one day become more Martian-like. So we’re seeing if plant growth under these conditions is possible.”

The corn plants were exposed to both ultraviolet and x-ray irradiation. Hoefler administered UV radiation by using a germicidal lamp in the lab. The X-rays

Once you meet Brandon Washington, you won’t soon forget his smile and caring attitude. That may be why the students he mentors listen when he offers advice on schedules, homework or day-to-day problems.

“I just love to help young people believe in themselves,” says Washington, a senior in biology and kinesiology.

Washington grew up in Arlington, Texas—home of the Dallas Cowboys. He thought he’d like to play college football, but the offers he received weren’t the right fit for him. He earned academic scholar- ships to Iowa State University and decided to come to Ames.

“My mom wasn’t too thrilled because it’s so far from home,” Washington says.

Since he arrived at Iowa State he’s been exploring different career options. He has the confidence and the grades to become a doctor, but isn’t sure that’s for him. Instead, he says, he found his calling working with students as a peer mentor.

“He knows the struggles involved in coming to the university setting,” says Lauren Westerdale, Biology Education Success Team (BEST) peer mentoring adviser. “He shares those experiences with students and encourages them to persevere and bounce back.”

He works with two peer mentoring groups, both in biology and kinesiology.

Westerdale says his leadership style is sincere and genuine,” Westerdale says. “He’s a fun, motivated student, and he really connects with students and wants to guide them. He helps them feel at home at Iowa State and become academically successful.

This past summer he interned at the Boys & Girls Club of Ames. With a summer school atmosphere focused on youth development, they offer programs for children ranging in age from six to 18.

The experience broadened his idea of what he hopes to do in the future. “I want to be involved in youth development in some way,” Washington says. “I’m hoping to go to graduate school in an area related to student development or student affairs.”
Iowa State has provided countless opportunities and because of that I’m a well-rounded individual

Cody West (left) and Cody Smith are CALS students serving as president and vice president, respectively, of the Iowa State Student Government. “Team Cody,” worked with Iowa State Interim President Ben Allen to address issues such as tuition increases and campus climate.

In a small office in the Memorial Union, Cody West and Cody Smith spend more than 20 hours a week together working on issues concerning students. If they aren’t in the office or in class they are meeting with students, administrators, legislators or attending the State of Iowa, Board of Regents meetings.

West, a biology senior, is serving as president of the Iowa State University Student Government and Smith, an agricultural and life sciences education and political science senior, is serving as vice president. Together they form “Team Cody.” The two received 54 percent of the student vote on March 8.

“One thing we talked about in the campaign is we are genuine people and when we say something we mean it. If we are putting something out there—we wholeheartedly believe it,” Smith says.

Smith grew up on a livestock farm in Indiana, and says he’s always had a passion for agriculture. He would like to pursue a career in ag policy. Smith has been involved with student affairs I realized I was a great opportunity for me, but as I got involved with students like Smith and West.”

As seniors, they both see the need to be involved, so we’re more focused on student government.” Smith says working to improve campus climate. Allen says he’s impressed with the student leaders who are effective advocates for students and excellent ambassadors for the university.

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“We are surrounded by amazing people,” Smith says. “We want to empower other students to find what they are passionate about.”
The Soils Judging Team took third place honors at their regional competition. The Crops Team (above right) earned second place in the Central Region in the Rodale Spreadsheet competition. The Dairy Science Club (above left) placed first in overall team judging in the Rodale Spreadsheet competition. The Agricultural Business Club received the Outstanding Chapter Award at the Agricultural and Applied Economics Association annual meeting. John Maubach, senior in agricultural business, placed first in the Earl O. Headley Hellos.
I was while earning her MBA that Amy Brandau realized the perfect job for herself. She had been working as an academic adviser—and had fallen in love with it.

Brandau (’00 agricultural business, ’08 MBA) found her undergraduate degree an ideal combination of her two interests: agriculture, thanks to the family farm where she grew up, and business, because of her mother’s bridal shop.

As an adviser in the Department of Economics, she uses her passion for working with college-age students to help economics and agricultural business majors navigate their Iowa State experience.

“I get to work with students the entire time they’re here, which is really fun, because I get to watch them mature, grow up and go on to do great things,” she says.

Brandau advises 250 sophomores, juniors and seniors—about 80 of them new to her this year.

“It’s only overwhelming at registration time, when I meet with students,” she says. “I feel strongly about meeting with all of them individually, so I can get to know them and be the best adviser.”

Students are required to meet with her once per semester, but at least half will visit with her multiple times.

“I tell my students I’m here so they don’t need to panic or lay awake at night and worry. They should stop in and we’ll figure out a problem together, sometimes just talking will help solve it.”

Conversations take place not only in her office, but also via email, at Agricultural Business Club meetings and even on sidewalks around campus.

Questions range from majors and minors, to career paths, internships and graduation plans.

“She’s always willing to meet with me—whether it’s about school, jobs or just to catch up,” says agricultural business senior Jessica Manthe. “She’s made me feel confident in my abilities and has helped calm me down numerous times when things got tough.”

Getting Oriented

Brandau teaches an orientation class for students transferring to Iowa State in agricultural business. For one class period, some of the last year’s transfers talk to the students about their experiences. Inevitably, they tell the new class how they helped them solve problems or prep for the career fair.

“It’s better when the students say it for me,” says Brandau. “And it’s gratifying when they want to come back and help the next class, which is part of the CALS culture.”

Ag business senior Grett Bolten appreciated Brandau’s help.

“I had a small case of transfer shock, and being in her Econ 110 class helped me out a lot,” he says. “She explained to me a drop in grades was to be expected. That way, I was prepared for it and could adjust accordingly the second semester.”

Students who start in spring have a more-difficult time adjusting. She started a spring semester orientation class last year to help those students meet others and to learn about Iowa State.

Club Collaboration

Part of Brandau’s job includes being an Agricultural Business Club adviser, along with professor Ron Deiter and assistant professor Georgeanne Artz (’95 PhD economics). The award-winning club has monthly meetings, brings in outside speakers and hosts events. The club offers opportunities for leadership development in committees as students run for office, or collaborate on projects and events.

“I always tell people, you’re going to have a good degree,” says Brandau. “Don’t worry about that. What Iowa State does well is make sure you’re employable with leadership skills, and Ag Bus Club just gives you a way to network and practice those skills.”

An annual student favorite is the fall industry tour.

“It’s been fun to go on these tours with the students,” says Brandau. “The people who are speaking to us are usually my age, so they’re people I went to school with. It’s neat to reconnect and find out what they’re doing now.”

Brexit Abroad

Last spring break Brandau co-led a 10-day Brexit study abroad trip with senior lecturer Terry Alexander. Twenty students explored the government and history of Great Britain in the wake of Brexit. The group posed outside the Houses of Parliament in Westminster where they toured the Commons Chamber and the Lords Chamber.

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It’s interaction with her students and advice that inspires CALS grad Amy Brandau, “everyone needs a cheerleader in their corner” says the agricultural business adviser.
I n October 2014 Tom Baas received life changing news. He was home sick thinking he had the flu, but went to the emergency room and was diagnosed with pneumonia, anemia and Acute Myeloid Leukemia. He was hospitalized immediately and stayed in the hospital for the next four weeks.

“I was sick—really sick. I went through five chemo treatments over the next several months. Those ended in February 2015. I went back to work in April and fulltime that fall,” says Baas, an animal science professor, student favorite and swine research extension specialist for more than 20 years.

The Block and Bridle Club came to the support of Baas by organizing a Pie the Professor event. Students raised $612 to toss a pie at Greg Krahn, an animal science lecturer who stepped in to lead Baas’ classes when he became ill.

**Reciprocal Relationship**

Krahn says the way students stepped up to help shows how much they care about Baas.

“If you talk to students in his classes, they would do anything to help him out and I think that shows what kind of person he is and how much people have benefited from his presence at Iowa State,” Krahn says. “I always told my students they are the best and that’s why companies are knocking at the door to be at our career fairs and meet them,” Baas says.

Baas knows how to make connections for students and understands the pork industry. He worked in the industry for 22 years before starting in his faculty position at Iowa State in 1994.

“My career has been very rewarding,” Baas says. “I brought real-world experiences to the classroom, which helped me prepare students for their careers. I always thought if I helped a student somewhere along the way then I accomplished something.”

One of Baas’ favorite classes was Pork Fellows, a class that introduced students to opportunities and professionals in the pork industry.

“Students had to convince me they wanted a career in the pork industry to get into the course,” Baas says. “Companies were always contacting me and asking if they could meet with students. Students loved it because they could meet with a broad spectrum of professionals.”

**Called to Be Bald**

Unfortunately, Baas’ Leukemia returned in December 2015, and he started chemotherapy again. This time, the doctor said his only option was a bone marrow stem cell transplant.

“In May of 2016 I had the stem cell transplant,” Baas says. “The transplant was basically a blood transfusion. I don’t remember anything for nine days following the procedure. My wife, Cindy, didn’t tell me until later, but there were three or four days when they weren’t sure if I was going to walk out of there.”

He was initially supposed to be in the hospital for 100 days, but was released after 24. For the next six months his immune system was too low to fight infection, so he could only leave his home to go to weekly doctor appointments in Iowa City.

The same spring Baas was signed up for a stem cell transplant, Chris Mandt, a senior in animal science, started fundraising for Be The Match, a national bone marrow donor registry. He and other members of the Iowa State University Farmhouse Fraternity were planning a Called to Be Bald event to raise awareness about the bone marrow donor program.

“We started planning our Called to Be Bald before we found out Dr. Baas had Leukemia,” Mandt says. “So, when we found out we decided to raise awareness for him.”

That first year the fraternity held a Called to Be Bald event to honor Baas the students raised more than $5,000, but today bone marrow donations are similar to blood donations.

“There are two different types of donations. If an adult donates to another adult it’s basically pulling stem cells from your blood, so it’s similar to a blood donation,” Marshall says. “For children, doctors prefer to use bone marrow. The process involves a shot in the hip and anesthesia is administered, similar to pulling a wisdom tooth.”

**Always a Cyclone**

Students, colleagues and alumni offered their support to professor Tom and Cindy Baas (center) during his battle with Acute Myeloid Leukemia. Lecturer Greg Krahn (left), stepped in to lead Baas’ classes and students organized awareness and fundraising events. Many even donated bone marrow. Will Tubbs (second from left) and Eden Lambart (right) are bone marrow donors and great student Billy Marshall (second from right) is a donor in the Be the Match program at Iowa State.

Marshall says people think of bone marrow transplants as painful and expensive. “That may have been true years ago, but today bone marrow donations are similar to blood donations.”

“Students asked me what they could do to help and I told them to donate blood or sign up to be a bone marrow donor.”

Krahn says Baas kept his sense of humor through it all. During his visits to the University of Iowa Hospital Baas told him, “Leukemia can do some evil things, but I promise I’ll always come back a Cyclone.”

Farmhouse Fraternity hosted a Called to Be Bald event on central campus to raise awareness and funds for bone marrow donation. Chris Mandt, a senior in animal science, and Billy Marshall, a graduate student in agricultural education and studies, helped organize the event which involved volunteers shaving their head to raise awareness about the ease and importance of donating bone marrow.
SMALL SCIENCE, BIG IMPACT

BIG ADVANCEMENTS THROUGH SMALL SCIENCE

What is “small science”? The origin of this phrase can be traced to the post-World War II era, as a contrast to “big science.” Scientists defined big science as projects such as the Manhattan Project, which ended World War II and launched us into the nuclear age, or the space program that landed humans on the moon.

In contrast, at that time physicists were explaining the evolution and consequence of science, from small to big. To put simply, big science projects are built on small science advancements. Take Robert Goddard’s invention of liquid-propelled rockets—his experiments in physics and aerodynamics as a teenager at home ultimately led to landing on the moon and the exploration of space. Biology, often described as small science, is launching into an exciting new era. This was largely made possible by applying physics and chemistry to develop new technologies advancing this new type of small science. These technologies speed up the process and accuracy of determining the structure of biomolecules (specifically, the DNA blueprint of plants and animals), and was the basis for the Human Genome Project. Thus, small science enabled big science.

Translating this biological blueprint will require the science of small things. The coming challenge is to determine the structures of millions of very small biological entities—proteins, RNA molecules, sugars, lipids, small metabolites—and we will need to know where they are within cells and tissues, and how they are affected as time elapses. Although we know many of these small entities, there are many more unknown awaiting discovery. How many are unknown?

When will we know we are done? Answering these challenges is big science on a small scale. This issue of STORIES explores research in the sciences on a small scale.

Iowa State University researchers are looking for discoveries in small plots. In small organisms or in small molecules, which will uncover advances and provide the foundation for major scientific breakthroughs. Analogous to going to the moon—small science deserves the investments of big science. There is a rich harvest of advances to gain from this big science of small things—cures to diseases, overcoming hunger and malnutrition and developing a sustainable economy.

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Looking for a Cure

From the Inside Out

Extending the life of those afflicted with muscular dystrophy is one of Josh Selby’s research passions. Selby, an associate professor of animal science, has spent his career studying muscle and ways it can be damaged. Since 2006, he’s been looking for ways to preserve muscle in boys who suffer from the genetic disease. Duchenne muscular dystrophy mostly affects boys, with one in 3,500 to 5,000 born with the disease. As preschoolers they begin to experience muscle weakness because an abnormal gene interferes with the production of a protein needed to form healthy muscle. Patients get progressively weaker, and usually by the age of 12 or 13 they will be in wheelchairs. Symptoms can lead to death in their 20s due to respiratory or heart failure, as their diaphragm or heart muscles weaken.

Since 2009, Selby and collaborator John Quindry at the University of Montana have been looking for a practical way to turn on a pathway thought to have therapeutic potential for those affected by this disease. After finding no pharmaceuticals available to safely activate this pathway, they turned to the study of a nutraceutical called quercetin. Nutraceuticals are plant-derived supplements that may have physiological impact. Quercetin is derived from many plant sources such as apples, peppers, tomatoes and leafy greens.

Their 10-month study uses multiple pairings of quercetin with other compounds. So far, Selby says quercetin doesn’t provide the “Wow!” he was looking for in skeletal muscles, but there might be some “real promise” for the heart.

In addition to investigating muscular dystrophy, he says he finds the way heat stress affects muscle fascinating. “I’ve developed an independent line of research to better understand what heat does to muscle that may cause damage,” Selby says.

The hope is lessons learned in the study of dystrophic skeletal muscle may also apply to heat stressed muscle and may, for example, decrease oxidative stress caused by environmental hyperthermia, says Donald Beermann (’71, animal science), chair of the animal science department.

“Research tools Dr. Selby uses to study muscular dystrophy are also used to investigate and understand the inflammatory signaling pathways and changes in energy metabolism and mitochondrial function in skeletal muscle associated with heat stress,” says Beermann.

Heat stress represents a significant human health concern as well as recurrent burden that detracts from growth efficiency in animal production. By better understanding hyperthermic muscle injury, there is the possibility this research will serve the dual purpose of decreasing human suffering as well as improving agricultural profitability and ensuring food security.

Selby joined the department in 2008. He teaches graduate-level physiology and muscle biology courses and advises undergraduate students. He plans to continue both lines of research with the hope of improving lives through decreased disease burden and improved food security and agricultural profitability.
Til the system of microorganisms and enzymes in soil are a key factor in how plants take up nutrients for growth. It’s a complex system. Marshall McDaniel’s research in the Department of Agronomy is trying to uncover a simple way to gauge soil health—soil’s decomposition ability.

“The faster soil can decompose material, the faster it can make those nutrients available to the plants,” says McDaniel. “Our goal is to give farmers an easy, inexpensive way to gauge how well their soil breaks down plant matter.”


Standard brewed tea bags are readily available, inexpensive and typically weigh the same regardless of name brand. A high-quality tea serves as a control since almost any soil system will be able to successfully decompose its perfect combination of carbon and nitrogen. However, the ratio of carbon and nitrogen in poor-quality tea is less than ideal. This imbalance tests the ability of soil microorganisms because poor-quality tea requires more inputs, like carbon, from the soil to breakdown.

McDaniel, an assistant professor, is studying soils’ decomposition ability in traditional cropping rotations and those with the addition of cover crops. He partnered with Practical Farmers of Iowa and has nine sites on privately owned farms and one site on Iowa State University land. The project is funded by The Leopold Center for Sustainable Agriculture.

“We haven’t done a deep analysis of the data yet, but early results show soil microbes improve even after just one year of a cover crop,” says McDaniel. “If the critical analysis confirms it, our next question will be, ‘why?’”

McDaniel wanted to get farmers involved by testing something they were curious about on their own farms. The project involves seven farmers burying and collecting tea bags themselves, as citizen scientists. One of these farmers is Nathan Anderson (’10 agronomy). “I was immediately intrigued,” says Anderson. “There are a lot of soil tests advertised, but this was low cost and the method was simple, straightforward and easy to implement.”

On Anderson’s farm, they are running five trials in the same type of soil. Three row-cropped fields have very different yield productivity. The two additional sites are in a rotationally grazed pasture and established alfalfa field.

“I wanted to see what else might be going on from a biological standpoint that could be contributing to the differences we’re seeing,” says Anderson.

A simple soil test like the one McDaniel has created can help farmers set soil health goals and gauge their progress.

As a farmer, Anderson says one of the most beneficial aspects of the tea bag test is the timeliness. “It’s going to give us a quicker report card for some of the tools we’re using for soil health, like cover crops,” says Anderson. “It has the potential to be a game changer in terms of measuring progress.”

Story by Tracy Schlater  
Image by Christopher Gannon

SMALL PRAIRIES OFFER ABUNDANT INSIGHTS

When Benjamin Gue viewed the site for Iowa State University in 1858, it was mostly tallgrass prairie, as was about 80 percent of the state. The farmer and legislator who proposed the bill that established the State Agricultural College and Model Farm commented on the 640-acre location.

... the great monotonous plain of waving grass only broken here and there by scattered groves... Standing on the eminence where the college now looms, we could only see one of the most beautiful landscapes in the west... 

The grassland gave way to the campus, but there are still patches of prairie at Iowa State used for teaching, research and extension. There are about a dozen plots in Story and Boone counties ranging from 3 to 70 acres.

“In one way these patches are a good reminder of our heritage,” says Mark Honeyman, associate dean of operations for the College of Agriculture and Life Sciences, which includes its research and demonstration farms.

Although small in size, these plots are rich with opportunities to discover. Between Science Hall and Science Hall II is a third-of-an-acre prairie plot named for Marvin Anderson, a former dean of extension, who did graduate work there, and Robert Dyas, a landscape architecture professor who was an expert on prairie. These small research venues offer great insight. Proximity and access benefit students and faculty alike.

Mary Harris (left), adjunct assistant professor in natural resource ecology and management, examines a bee trap located in the prairie plot at Iowa State’s campus between Science I and Science II. Faculty in natural resources ecology and management, entomology, and ecology, evolution and organismal biology frequent the small plot for research and class activities.

That prairie also was part of the Monarch butterfly habitat project and surrounds a 300-year-old burr oak, which is the 1st-largest in the state of Iowa. Prairie plots also are labor-savers. “If it’s a well-established prairie, we don’t have to mow it or control weeds, and we only need to burn it every few years,” Honeyman says.

In addition to the restored prairies, there is a 3-acre patch of native prairie (original to pre-stillage times) at the university dairy farm. Two acres of restored prairie were added and it was named for Marvin Anderson, a former dean of extension, who did graduate work there, and Robert Dyas, a landscape architecture professor who was an expert on prairie.

These small research venues offer great insight. Proximity and access benefit students and faculty alike.

Story by Ed Adcock  
Image by Christopher Gannon
Ginny Mitchell has a fondness for something that may make other people’s skin crawl. She loves insects, and has made a career out of it. Mitchell has worked for Iowa State for five years in the Department of Entomology, running the Insect Zoo. She takes the Insect Zoo around Iowa providing educational programs and exhibits.

Two new species were added to the Insect Zoo’s collection of 100 species last year—the Malaysian giant walking stick and the Hercules beetle. The Insect Zoo purchased a male and female of both species, although the female Hercules beetle did not survive the import process from Taiwan.

The Malaysian giant walking stick is the third largest insect in the world, behind two other species of walking sticks. It can detach its legs when it feels threatened, and then can grow them back. The male Hercules beetle has long horn-like pincers extending from its head. It could make short work of cracking open a nut because the pincers can grow up to two to three inches long. The pincers are used in mating rituals and fighting over food.

20 years of engaging, education

This year, the Insect Zoo is celebrating its 20th anniversary. In 1997, it began as an entomology outreach program to engage kids in the life of insects, using a hands-on approach.

“Our mission is to introduce children to arthropods,” Mitchell says. “This includes insects, spiders, tarantulas, millipedes, centipedes and scorpions. We want to teach them their biology and importance to our environment. People may think cockroaches are disgusting, but really they are the garbage collectors of our planet. We couldn’t live without them. We also want to give people an appreciation for an animal that is usually stepped on.”

Mitchell created a course based on the state’s core curriculum so science teachers can bring the zoo into classrooms. The zoo meets the requirements for teaching about metamorphosis, insect defenses and their roles.

“Insects are essential to Iowa. Without ants to till the soil, cockroaches and beetles to break down dead animals and plants, bees and flies to pollinate plants and mayflies and caddisflies to keep the waterways clean, none of our ecosystems could function,” says Joshua Byrne (17 animal ecology) who worked with Mitchell as an undergraduate. Byrne is currently employed at the Little Rock Zoo in Arkansas, and is a classroom teaching assistant at Pediatrics Plus Developmental Preschool.

The Insect Zoo’s goal is to present many different species to spread knowledge. Diversity is key. Arthropods are the most diverse animal on this earth. There are more arthropods than any other animal combined,” Mitchell says. “If we can display the diversity within this group of animals, then people will be even more amazed and appreciative.”

Have bugs, will travel

The Insect Zoo obtains species from different institutions that import the insects. Mitchell also travels to Arizona to gather insects from the desert. At an Insect Zoo event, Mitchell will bring five to 100 species. She chooses insects based on their ability to adapt to diverse situations and their hardiness. Mitchell carefully watches over and protects them during handling.

Mitchell’s favorite memory is from one school demonstration. A second grader ran up afterwards and handed her a drawing of the two of them. The little girl wrote: “I want to be like you when I grow up.”

The Insect Zoo has been growing in popularity. In 2016, Mitchell presented more programs than in the entire 20-year history. It was featured at 355 events at schools, birthday parties, nursing homes, daycares and fairs. In 2016, the zoo reached more than 34,000 Iowans.
The development of antibiotics is one of the greatest discoveries of humankind, resulting in countless lives saved from the devastation of infectious diseases.

Antibiotics are important for modern animal agriculture and have been widely used for the prevention and control of animal diseases. Recently, the value of these “wonder drugs” has diminished due to the drastic increase in antimicrobial resistance, threatening public health and raising the specter of multibillion dollar medical costs and economic losses. Antimicrobial resistance also is an ecosystem problem impacting the health of humans, animals and the environment.

Antibiotic-resistant bacteria can develop in the digestive systems of humans and livestock receiving antibiotics. There also is concern humans may be exposed to the resistant bacteria from livestock receiving antibiotics. There also is concern humans may be exposed to the resistant bacteria from livestock receiving antibiotics. There also is concern humans may be exposed to the resistant bacteria from livestock receiving antibiotics. There also is concern humans may be exposed to the resistant bacteria from livestock receiving antibiotics.

Collaborating to combat resistance Iowa State University has a group of diverse, highly experienced scientists working on a broad range of topics related to antimicrobial resistance. In 2015, a university-wide antimicrobial resistance initiative was established involving approximately 60 faculty members across several colleges and USDA National Center for Animal Health scientists.

Additional researchers and health professionals from several other Midwest institutions joined the effort and are helping to develop new interdisciplinary research projects. There are now more than 100 researchers involved in addition to Iowa State University faculty and staff. “We want to continue to expand our initiative into a larger regional and national consortium, which we propose to call the Antimicrobial Resistance Consortium,” says Paul Plummer, associate professor of veterinary diagnostics and production animal medicine. “The initiative will take a systems-oriented approach so the biology and ecology of organisms are understood within the context of crop and livestock production and social, economic, environmental and other factors.”

Hongwei Xin, assistant dean for research in the College of Agriculture and Life Sciences, says stakeholders must work together to ensure guidelines are followed and emergence of resistance is monitored.

“Antibiotics contribute to antimicrobial resistance and impact people, animals and the environment. Trying to fix the blame for the global antimicrobial resistance pandemic on a single source or use is contrary to the broad, systems approach required to make progress,” says Xin. “Critical research is needed on transmission of antimicrobial-resistant organisms through the environment, contact and food.

Multi-pronged approach to mitigation Interdisciplinary teams of researchers have numerous projects underway providing valuable information on the transport of antibiotics, antibiotic-resistant bacteria and antibiotic resistance in the livestock food chain and the effect of manure application timing and management on the presence of antibiotic-resistant bacteria. In one such project, researchers received a nearly $1 million grant from the U.S. Department of Agriculture’s National Institute of Food and Agriculture (USDA-NIFA) to advance the technological tools used to detect antimicrobial resistance and farm strategies to slow its spread.

Led by Adina Howe, an associate professor of agricultural and biosystems engineering, the three-year project brings together researchers from Iowa State University, the USDA and Grinnell College. The team will improve a new technology called DART-E-QM, which is designed to efficiently sequence the genes of microbes.

They will gather manure, soil and water samples from swine operations and use DART-E-QM to sequence genes associated with resistance in the samples. The team will determine which genes may allow antimicrobial resistance to develop and persist in the environment. The researchers also will look at what production practices and environmental factors, such as drought or flooding, contribute to the propagation of resistant genes.

“We want to identify control points where we see reservoirs of resistance,” says Michelle Soupir, an associate professor of agricultural and biosystems engineering and a contributor to the project. “Once we do that, we can help determine mitigation efforts.”

Reducing resistance on farm Members of the DART-E-QM research team, including Soupir, Howe and Thomas Mostrom, scientist at the USDA National Laboratory for Agriculture and the Environment and affiliate associate professor of agronomy, are working with Dan Andersen to consider practical mitigation efforts for reducing the spread of resistance in agricultural environments.

Andersen is an assistant professor of agricultural and biosystems engineering. In addition to the USDA-NIFA grant, much of their work is funded by National Pork Checkoff dollars. They’re comparing effects of alternative swine manure treatment and storage.

“Manure is a great fertilizer resource on a farm. Livestock production is a critical component of sustainability as the majority of nitrogen, phosphorous and potassium we feed ends up in manure and needs to be recycled,” says Andersen. “Managing microbes for soil health, including the presence of antibiotic-resistant bacteria, is an evolving science.”

Andersen says each method under consideration in their collaborative research shows potential for reducing antibiotic-resistant bacteria in swine manure.

Mitigation efforts under consideration include:

• Anaerobic digestion—This system could include capturing the resulting natural gas for energy.
• Two-phase manure storage—Holding manure longer in two different basins allows the natural microbial community more time to reduce the presence of antibiotic-resistant bacteria. • Addition of ionophores—Narasin (a brand of the antibacterial agent lipomycin) is an approved feed additive designed to reduce methane in swine manure, and it may hold potential for reducing the presence of resistant bacteria as well.
• Centrifugation—Separating liquid manure from solid has shown antibiotic-resistant bacteria tend to stay in the solids.
• Separating solid manure from liquid as manure is removed from facilities—This is planned for inclusion at Iowa State University’s proposed new facilities.

“Preliminary results show two-phase storage reduces the presence of antibiotic-resistant bacteria, and centrifugation can remove as much as 100 percent under high speeds for an extended time,” Soupir says. Andersen says some of the strategies are showing promise for an additional benefit: the reduction of odor by 10-15 percent.
Key Points from ISU Experts on ANTIBIOTIC RESISTANCE IN LIVESTOCK

Iowa State University faculty have broad expertise and experience in the area of antibiotic use and antibiotic resistance in livestock and poultry, and work closely with stakeholders on addressing these issues. The following are key points to consider from the perspective of Iowa State researchers, veterinarians and extension specialists.

- The U.S. meat supply is safe. The USDA Food Safety Inspection Service oversees the safety of meat.
- Veterinarians and livestock producers strive for prudent, judicious use of antibiotics and have established guidelines and training materials to help ensure antimicrobials are only used when necessary and are administered appropriately.
- Antibiotic use remains an important option for reducing animal suffering. Veterinarians carry out proper treatment plans for animal health and animal welfare, including the use of antibiotics to reduce suffering and death from treatable illnesses.
- Approximately 30 percent of animal antibiotics are not used in human medicine. This class of drugs, called ionophores, is used to prevent and control coccidia, a family of disease-causing parasites. Ionophores are not associated with the development of antibiotic resistance that would impact human health.
- Comparing livestock antibiotic use to humans can be misleading. The statement “80 percent of antibiotics are used in animals” often is a common claim cited in news media and by some organizations. That statistic lacks context, and the FDA has cautioned against comparing human and animal numbers. Differences in scale exist between livestock and people in terms of dosing and volume used.
- Antibiotics that are deemed medically important for humans have been restricted for use in animals to treat, prevent or control disease. In 2013, the FDA called on animal drug manufacturers to stop labeling their products for promotion of animal growth and to change the labeling to require veterinary oversight when they are used for therapeutic purposes. No antibiotics that are defined as medically important for use in humans are used for growth promotion; their use is limited to treatment, prevention and control of animal disease under the direct supervision and monitoring of veterinarians.
- The FDA rigorously evaluates new livestock antibiotics. Before final approval, the FDA is required to assess the safety of animal drugs to ensure low risk for antimicrobial resistance transmission to humans. This measure also ensures the continued safety of meat products.
- U.S. poultry farms have monitored antimicrobial resistance since 2014. The poultry industry, in collaboration with the USDA National Antimicrobial Resistance Monitoring System, began collecting on-farm bacteria samples to monitor antimicrobial resistance. The goal of this ongoing study is to monitor antimicrobial use and resistance over time.
- New, research-based alternatives to antibiotics exist. The implementation of research-based technologies— including improvements in the engineering of animal housing, the use of effective vaccinations, improved nutrition and genetic selection—is allowing the livestock and poultry industries to emphasize alternative approaches to improving efficiency that replace the use of antibiotics for growth promotion.

Paul Flummer, associate professor, veterinary diagnostics and production animal medicine; Guang Zheng, associate dean for research and graduate studies, College of Veterinary Medicine; Hongpani Xue, assistant dean for research, College of Agriculture and Life Sciences; Donald Beermann, chair, animal science

STORIES EXTRA: www.stories.iastate.edu

Visit STORIES online for links to the Iowa State University Antimicrobial Resistance Consortium, the American Veterinary Medical Association Resources on Antibiotic Use and Antimicrobial Resistance and Food and Drug Administration Guidance Documents.
A Two-Scientist Home

If regimented order, neatness, scientific method and well-scrubbed stainless-steel rule a scientist’s workplace, does that carry through to a scientist’s home?

Not in this case. Yandeau-Nelson admits. “Their home goes through the same cycles of tidy and disorganized as every home.”

“Sometimes the neat scientists come home and they want to be opposite of neat,” explains Nelson. “There is some shop talk, though. ‘If you ask our kids (Ada, 10, and Ian, 7) they feel we talk about it way too often, but I feel like we don’t,’ says Nelson.

‘If there are issues in either of our labs we look to each other,’ Yandeau-Nelson adds, ‘not specifics, but questions of styles, how to run a lab and things like that.’

“We cover for each other at home when someone is working long hours, but if Marna was a lawyer working late it would be the same thing,” says Scott: “There’s nothing intrinsic about the fact that we’re both professors on-campus that causes any problem. We think it’s only positive, really.”

STRANDS OF CORN, SILK AND DNA

Scott Nelson and Marna Yandeau-Nelson combine genetic and biochemical science at work with a home life of raising a garden, two kids, a dog and batches of beer.

She comes from upstate New York, came to Iowa to be a pharmacist, fell in love with corn, a guy who helped her unload her car and “field days.”

He’s from near Fargo, North Dakota, grew up loving science fiction, enjoys tinkering with antique engines, studying double-strand DNA breaks and sharing great proposal drafts with his special someone.

The two conduct research that could some day—albeit years from now—take a bite out of cancer and dramatically boost crop yields.

Yandeau-Nelson’s research passion is corn. She studies genetic networks of plant cuticle lipids (the waxy substance on the surface of plant leaves and corn silk) and their protective properties against environmental stresses.

Nelson is an associate professor of biochemistry, biophysics and molecular biology. He focuses on what’s been called the “keystone complex” of DNA repair, specifically related to double-strand breaks. Understanding how the body repairs severe double-strand breaks could lead to pharmaceutical breakthroughs.

A matchmaking mutual friend was the catalyst for their personal chemistry. It led to their wedding in 2004 in the midst of a long-distance relationship while she earned her doctorate at Iowa State and he served as a post-doc at Penn State.

Five years later, they found two positions at their alma mater. Although both work in departments shared between the College of Agriculture and Life Sciences and the College of Liberal Arts and Sciences, they don’t work in the same research lab or building.

The Tale of Two Strands

Yandeau-Nelson studies genetic networks of plant cuticle lipids and their protective properties against environmental stresses. Cuticle lipids make up the waxy substance on the surface of plant leaves and corn silk.

Understanding how these chemicals produced could lead to advances in crop protection, including drought-resistant corn. Since these waxes are chemically similar to components of petroleum, the research could have biofuel applications as well.

Coulomb’s Law

Say hello to Scott Nelson and Marna Yandeau-Nelson, a physical example of Coulomb’s Law, something very few people can name, but everyone knows about.

“We’re very much an opposites-attract couple,” says Yandeau-Nelson, assistant professor of genetics, development and cell biology. French physicist Charles-Augustin Coulomb proved the physics law of opposites attract and like charges repel in the world of electromagnetism in 1784.

William Shakespeare chronicled it as a romantic truth 200 years earlier.

“He’s a very even-keeled kind of guy,” says Yandeau-Nelson. “Things don’t upset Scott as easily.”

Scott often refers to Marna’s research passion as corn. She studies genetic networks of plant cuticle lipids (the waxy substance on the surface of plant leaves and corn silk) and their protective properties against environmental stresses.


Scott Nelson and Marna Yandeau-Nelson combine genetic and biochemical science at work with a home life of raising a garden, two kids, a dog and batches of beer.
DNA is everywhere, including the root system of plants. Up until now few have studied the genetic basis of root structure because it’s difficult to observe how roots grow underground.

Adheesh Singh, professor of agronomy, and his doctoral student Kevin Falk are two of the few doing it with help from Baskar Ganapathysubramanian, professor of mechanical engineering, and Gwyn Beattie, professor of plant pathology.

The idea to focus on researching root traits and their microbiome (the tiny community of microbes living on roots) came directly from a brainstorming session at a workshop conducted by the Iowa Soybean Research Center.

The Singh research team will dig and clean them. Over 100,000 images will be taken in the team’s custom-designed photo booth using studio lighting and multiple cameras to dig up the root systems and properly clean them. Then, they started digging.

“You can imagine the difficulty of digging up more than 1,000 samples by hand and carefully cleaning off soil and debris,” says Singh. “We take photos of each root system.”

It’s a team effort. There are 12 undergraduate employees, nine graduate students, four staff members and two postdoctoral researchers working on the project. Working in teams of eight to 10 people, it took hundreds of hours to dig up the root systems and properly clean them.

“I consider myself more of an archeologist than a ditch-digger,” says Falk. “Taking our time to extract the root in the best possible condition for high-quality data is difficult.”

Over 100,000 images will be taken in the team’s custom-designed photo booth using studio lighting and multiple cameras while rotating the root to different positions for multiple angles. Photos are uploaded into software created by Ganapathysubramanian to analyze the architecture of the root system.

Digging deep for data

Singh and Falk assembled 300 different types of soybeans from 19 different countries. They grew them in controlled environments and in Iowa farm fields. Then, they started digging.

“It is a challenging research topic, and we have a very vibrant collaboration between breeders, geneticists, engineers and computer and data scientists allowing us to work in this area,” says Singh. “We try to ask questions relating to real life applications and usefulness to farmers to improve their profitability.”

The collaboration has allowed us agronomists to build technical skills including digital image processing, high-throughput pipeline development and data management,” says Falk. In addition to the genetic traits, Gwyn Beattie, professor of plant pathology, is looking at the community of microbes found on and within the roots. “The roots are covered with diverse communities of microbes, which are influencing the plant in ways most people didn’t expect,” says Beattie.

These microscopic organisms are a city of activity within and along the root systems, affecting the plant in multiple ways. Combining that information with what’s happening above ground will give us a better understanding of how soybeans respond and why.

“Microbes tend to hang out together, like neighborhoods,” says Beattie. “Some are always together and others never hang out. If you take away one, do the whole neighborhood fall apart? We’re trying to find the organisms that are key to the structure of these communities and their ability to affect plant roots.”

Mapping roots’ microbiome

Up until recently the tools to take apart a microbial community didn’t exist. The DNA of these microbes, however, provides name tags to identify which ones and how many are there. With these name-tags, Beattie can quantify and locate microbes and within the root system as the roots grow through soil.

Creating a map of the microbiome on the different parts of a soybean root system, and seeing how this map changes as the plant grows, has not been done before. It is an important step toward identifying how microbes promote root growth, and therefore plant growth.

“We want to know which microbes are most useful for making soybeans tolerate things like low phosphorus, drought, high temperature stress,” says Beattie. “If we understand why things work the way they do, we can make them work better.”

The Singh research team will dig and photograph all of the root systems by the end of the year. In the following year, these photos will be analyzed using the software Ganapathysubramanian created, and Beattie and Amy Welty-Bernard, a postdoc driving the microbiome project, will draw the initial maps of the root microbes.

What they’ve found so far is exciting. “We see tremendous diversity for root traits, which is very encouraging,” says Singh. “Once we are able to connect root related traits with above ground traits we will be able to take the next steps in breeding and science for soybeans.”

Combining the genomics of the root systems with the microbial influences could provide tremendous opportunities for new varieties of soybeans. Developers could be able to strategically select genes for root features the way they select for growth above ground.

The project is funded by the Iowa Soybean Research Center, the Raymond F. Baker Center for Plant Breeding and the Monsanto Chair in Soybean Breeding.
FULL STEAM AHEAD

4 LAB-TESTED TIPS FOR ENTREPRENEURIAL SUCCESS

Story by Darcy Maulsby
Images contributed

While Diane (Ducommun) Young grew up on a farm near Larrabee and working for local veterinarians during high school, the odds of her returning to rural Iowa for a career were good.

“In the 1980s Farm Crisis, you were encouraged to avoid a career in agriculture,” says Young (’91 animal science, ag microbiology).

As her career in foodservice quality assurance and purchasing took her across the nation, away from her husband and young son for days at a time, a career staying in rural Iowa began to look more attractive. Young left the corporate world and launched Foundation Analytical Laboratory in Cherokee in 2009.

Today, the 20 full-time employees and two part-time employees at Foundation Analytical Laboratory test everything from food products to regulatory water samples to co-products from the ethanol industry. This isn’t your typical testing lab, says Young, whose team serves more than 800 customers, including 80 ethanol plants nationwide.

“The science of chemical and microbiological analysis is the backbone of Foundation Analytical Laboratory, but the art of human relationships is our livelihood,” says Young, who is passionate about providing high-quality, science-based jobs in rural Iowa.

Four keys to success
Not only does Young encourage students to pursue careers in science, technology, engineering and math (STEM), but she emphasizes the “art of communication” (verbal and written) must be part of STEM to provide the STEAM for business success.

This philosophy grew out of Young’s frustrations when she was a customer of various contract labs. “I’d have to follow up for results, and sometimes I wasn’t even sure the lab was providing good quality data,” she says.

Young vowed to do things differently. When Young worked in quality assurance for a foodservice company, Boston-based consultants advised her employer to get out of rural markets. This assessment, along with the consultants’ idea to compete mainly on price, didn’t sit well with Young. She says, “if you’re no different from the competition, why should anyone do business with you?”

Focus on the triple bottom line. The three benzene rings in Foundation Analytical Laboratory’s logo represent the interconnections between feed, food and the environment, as well as the triple bottom line: “We strive to be the laboratory provider of choice, the employer of choice and the investment of choice,” Young says. “We’re a highly-educated group of hard-working, Iowa farm kids who do what it takes to get the job done.”

Inspirng the next generation
Many of these success strategies took root during Young’s years at Iowa State University, where professors including Bill Wunder influenced her career path. “I absolutely loved my time at ISU,” says Young, whose husband Nate (’91 fisheries and wildlife biology) also is an Iowa State graduate. “It was challenging and taught me how to succeed wherever you are.” The Youngs are proud their son, Zane, will earn his mechanical engineering degree from their alma mater in the spring of 2018.

ISO gives you a lifetime of memories,” Young says. “Some of my favorites are my Rodeo Club and Block and Bridle activities, football and basketball games and developing lifelong friendships.”

Young introduces local students to Iowa State University degree programs that lead to STEM careers. She offers tours of Foundation Analytical Laboratory in Cherokee and promotes STE(A)M careers at local schools.

“As our business grows, I’m proud to offer internships to fellow Iowa Staters,” she says. “It’s even more exciting to offer competitive positions for people interested in living and working in our great state.”
Rob Stout has been described a number of ways. Master farmer. Award-winning conservationist. Community volunteer. Good neighbor. Farmer-scientist.

Evidence of these roles can be found in the fields surrounding his home near Washington, Iowa.

Orange flags dot the landscape marking data collection points for Iowa State University research. At any given point, Stout has numerous collaborative research projects underway. “I’ve never stopped to count them,” he says. A recent conversation revealed at least six ongoing studies.

“I just love that stuff. I seek it out when it comes to research,” Stout says. “Working with Iowa State gives me the best of both worlds (farming and research). I can’t wait to get the results and think of ways to implement them into our farm.”

The flags in fields closest to his home mark the location of buried tea bags. The decomposition of the tea bags will help Iowa State researchers better understand factors affecting soil health—a topic close to his heart (read more about the project on page 16).

Stout (‘78 farm operations) worked as an undergraduate research assistant for Walter Fehr (‘67 PhD agronomy), Charles E. Curran Distinguished Professor in Agriculture, and was advised by Maynard Hogberg (‘68 agr and life sciences education, ‘72 MS animal science; ’78 PhD) during his time at Iowa State. Both professors tried to recruit him to pursue graduate school in their programs.

But, opportunity knocked when a neighbor of the Stout family invited him to meet around their kitchen table during his senior year at Iowa State. The neighbor had a few hundred acres of tillable ground available for rent. Stout’s course was set.

His drive to learn and discover deepened throughout his farming career. So did his kitchen-table collaborations. He gathered friends and neighbors together to create the West Fork Crooked Creek Watershed Improvement Project. Joining them at the table was Jamie Benning (‘01 agronomy, MS ‘03 soil science) water quality program manager for Iowa State University Extension and Outreach.

“There are several characteristics we look for when identifying farmers to lead water quality efforts including experience in agricultural, conservation and community organizations. Another characteristic is their drive to collect data and evaluate new practices. Rob is a great example of this type of scientist-farmer,” Benning says. “He is a great collaborator in on-farm research and demonstration projects.”

Due in part to their leadership efforts, West Fork Crooked Creek Watershed and two neighboring watersheds received funding from the Iowa Department of Agriculture and Land Stewardship Water Quality Initiative to support conservation and water quality practice implementation. The watershed was able to install two bioreactors and cover crop adoption has grown to over 15 percent of corn and soybean acres compared to the statewide average of 2-3 percent.

“It’s our duty as farmers to be good stewards of the land and leave our water quality better than we found it,” Stout says. “Everything we do impacts our watershed. I’m surrounded by a lot of good farmers and neighbors who also care about their ground and how we leave it for future generations.”

Stout has been farming for 35 years, and his farm has been in his family since 1926. Stout farms 1,100 acres and manages a hog operation of 9,000 head. His stepson, Alex, works with him handling facility management and partners in conservation efforts to encourage wildlife and plant diversity.

No-till terraces, grass waterways, prairie strips—the list of conservation practices on the Stout farm runs the full gamut. They inject manure from their hog operation into the fields to target nutrients and reduce run-off. And, he’s seen a dramatic decrease in the amount of nitrates leaving his farm thanks to the bioreactor installed in 2014.

“The bioreactor has lowered nitrate levels in the tile water by nearly 70 percent over three years, and other practices have reduced nitrates by 30-45 percent,” Stout says. “I’ve noticed a decrease in nitrogen exiting the bioreactor as high as 99 percent in late summer and early fall. The average during spring rain events ranges from 40-60 percent reduction in nitrogen.”

Stout has been an active participant in Iowa Learning Farms and Practical Farmers of Iowa cover crop projects. He started by planting 10 acres of cover crops in 2009 and is now managing all 1,100 acres using cover crops. Since adopting cover crops he’s noticed improved soil health and a small yield bump, around five percent in soybean yields.

“I could tell the cover crops were helping to prevent erosion and build soil organic matter almost immediately. I can pull up a spade full of soil anywhere in the field and find earthworms. That’s a good sign of soil health,” he says.

The Stout family’s commitment to conservation is clear and award-winning. Their family was one of the first to receive the Iowa Farm Environmental Leader Award from Gov. Terry Branstad at the 2012 Iowa State Fair. Stout has been named the Iowa Soybean Association Environmental Leader of 2016 and the 2017 Gary Wergin Good Farm Neighbor Award Winner.

Stout loves to share his enthusiasm and experience with other farmers. His ability to connect and lead earned Stout leader-ship positions in the Iowa Farm Bureau, Iowa Corn Growers Association, Iowa Soybean Association, Iowa Pork Producers Association and as a trustee for his church. He’s also a member of the Timely Tips panel of experts in Wallaces Farmer and hosts field days and members of the media throughout the year.

“Meetings. I go to a lot of meetings,” Stout jokes. His wife Jean agrees. “But he loves it,” she adds with a smile.

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I knew I was home," she says. Following the internship, she stayed involved with the Agricultural Entrepreneurship Initiative (AgEI). As graduation neared and she was searching for her next move, her mind churned. She had always wanted to travel to all 50 states. She was a seasoned road-tripper thanks to years of visiting family scattered around the Midwest. She had an undeniable passion for helping farmers tell their stories.

With the encouragement of mentors from AgEI, she pitched a "crazy idea" to her former supervisors at Beck's. "I had made up my mind to travel all 50 states in one year to tell farmers’ stories," she says. "I asked them if they wanted to be a part of my journey.” A week after graduation she hit the road.

"I approached them at the next CALS Career Day," says Sents. "I want this internship." She approached Beck’s at the College of Agriculture and Life Sciences Career Day later that semester. They turned her down for an internship and encouraged her to get more experience. She started blogging and took to social media to build her network. Then, she went back to Beck’s the following year.

"I had made up my mind to travel all 50 states in one year to tell farmers’ stories," she says. "I asked them if they wanted to be a part of my journey.” In partnership with Beck’s she traveled over 100,000 miles, interviewed more than 100 farm families and hit her goal of reaching all 50 states in one year. While she learned a great deal about American agriculture along the way, she says some of the greatest lessons were about connecting with people.

"I noticed a butterfly effect throughout the year," she says. “Stories told by one farmer would illustrate how others have impacted their life and how they've impacted the lives of others. This interconnected impact of people on one other was a common theme among my visits.”

Sents is still carving out her version of the American dream. She's busy speaking with groups about her experiences and recently became a digital content editor for Successful Farming.

"I knew I was home," she says. Following the internship, she stayed involved with the Agricultural Entrepreneurship Initiative (AgEI). As graduation neared and she was searching for her next move, her mind churned. She had always wanted to travel to all 50 states. She was a seasoned road-tripper thanks to years of visiting family scattered around the Midwest. She had an undeniable passion for helping farmers tell their stories. With the encouragement of mentors from AgEI, she pitched a “crazy idea” to her former supervisors at Beck’s. “I had made up my mind to travel all 50 states in one year to tell farmers’ stories,” she says. “I asked them if they wanted to be a part of my journey.”

A week after graduation she hit the road. In partnership with Beck’s she traveled over 100,000 miles, interviewed more than 100 farm families and hit her goal of reaching all 50 states in one year. While she learned a great deal about American agriculture along the way, she says some of the greatest lessons were about connecting with people.

“I noticed a butterfly effect throughout the year,” she says. “Stories told by one farmer would illustrate how others have impacted their life and how they’ve impacted the lives of others. This interconnected impact of people on one other was a common theme among my visits.”

Sents is still carving out her version of the American dream. She’s busy speaking with groups about her experiences and recently became a digital content editor for Successful Farming.
When she joined the crew of the USS Enterprise (CVN-65) Jacqueline McGrew became the first woman to operate the world’s first nuclear-powered aircraft carrier. McGrew (‘11 biology) landed the gig, as a nuclear electronics technician in the US Navy after falling out of the University of South Florida. A military brat herself, she’d traveled the world as her father served in the US Air Force. She says her assignment was the result of aptitude and coincidence.

“The recruiter got a bonus for placing a female and minority in the nuclear program. I went to the Air Force recruiter first, but he was out to lunch and the navy recruiter was there. After I completed my first test his eyes lit up, and he asked if I had ever thought of the nuclear program,” she says. “He drove me to another recruiter so I could take another math test. From that moment, we never talked about any other job.”

She gained incredible experience in reporting, metrics, quality control and systems management in the Navy. Through her service she also met her husband Joshua, an Iowa native, and they made plans to attend Iowa State University together.

Her interest in science led her to major in biology at Iowa State. An internship with Charles Block, a USDA-ARS collaborator in plant pathology and microbiology inspired her interest in plants. She helped Block study corn diseases by setting up experiments, collecting samples and tracking data. Combined with her skills earned in the Navy, McGrew uncovered her penchant for scientific protocols.

As a quality systems specialist at Catalent Pharma Solutions, in Kansas City, Missouri, she is responsible for the management and quality assurance of systems used to develop and manufacture pharmaceuticals.

“Jacqueline’s position was created to allow us to stay on the forefront of FDA regulatory agenda. She’s the first in Catalent to fill this role, and one of the few in the company involved with metric reporting. She does a lot of data mining,” says Joel Scholtenstein, quality systems manager. “She’s built upon her natural ability through proactive training and continuing education.”

“One of her drugs was recently fast-tracked by the FDA to fight leukemia without the adverse side-effects of other chemotherapy drugs. McGrew shared her experiences with the college’s George Washington Carver intern this summer after answering a call for volunteers in the alumni e-newsletter STORIES Online.

“The students really enjoy that if you fail it’s not the end of the world. You have to move on. At Iowa State I took on too much — a huge course load and worked two jobs. I went in for academic assistance and advisor services helped me cut back on my course load and finish,” McGrew says. “The support I received at Iowa State gives me reason to come back and hopefully inspire others.”

CALS Alumni, Friends Honored by College, Alumni Association

CALS graduates were honored by Iowa State for service to the college and agricultural and the sciences industries during Homecoming events in October.

CALS Awardees

Floyd Andre Award:

Todd B. Hall (’82 animal science), executive vice president, Carall

George Washington Carver Distinguished Service Award:

Gerald E. Klonglan (’58 rural sociology, ’62 MS, ’63 PhD), emeritus professor, Iowa State University Department of Sociology; retired associate dean for national programs, Iowa State University College of Agriculture and Life Sciences; retired assistant director, Iowa Agriculture and Home Economics Experiment Station.

Henry A. Wallace Award:

Catherine E. Woteki, professor, Iowa State University Department of Food Science and Human Nutrition; former chief scientist and undersecretary, U.S. Department of Agriculture; former CALS dean.

Outstanding Young Professional Award:

Dawn E. Relfsdl (’11 agronomy, ’13 MS crop production and physiology), manager, Midwest field development, Valent U.S.A.

Alumni Association Awards

James A. Hyslop Alumni Volunteer Service Award:

Kyle S. Flander (’13 industrial technology), process improvement engineer, Entegrity/Iamer

Claire E. Masker (’95 animal science, agricultural and life sciences education, ’98 MS agricultural and life sciences education), director of public relations, National Pork Board
Waterhemp is one of the worst weeds Iowa farmers face. It produces a large number of seed and germinates late in the summer so it is not controlled by early season herbicide applications. It has incredible genetic diversity, which allows for increased herbicide resistance. Multiply its growing power and resistance, and the result is its genetic cousin—Palmer amaranth.

Palmer amaranth is a pigweed species not native to Iowa. Since moving into the state from the south in 2013, it has been found in 50 counties. With no easy treatment options, Iowa State University is working with farmers, industry specialists and state agencies to slow its spread.

“Be constantly alert,” says Bob Hartzler, agronomy professor and weed specialist with Iowa State University Extension and Outreach. “The majority of Iowa’s fields have waterhemp, so it’s so easy to get complacent when encountering pigweeds.”

Hartzler (’78 agronomy, ’87 PhD) teamed up with the Iowa State University Extension and Outreach crops team including Meaghan Anderson, extension field agronomist. Together they raise awareness of the dangers of the weed and the importance of vigilance and management.

“We want farmers to be able to identify Palmer amaranth in fields and understand how important it is to manage it quickly and properly,” says Anderson (’12 agronomy, ’14 MS crop production and physiology).

They work with industry and government partners to offer statewide meetings, media campaigns and extension publications to help curtail its spread.

“Working with Iowa State University Extension and Outreach is important because they are an unbiased party giving farmers direction,” says Dean Grossnickle (’95 agricultural business), field agronomist with Syngenta. “They’ve done a very good job of raising awareness. You aren’t crying wolf—it’s a very bad weed. By being proactive we still have a chance to manage it.”

While widespread crop losses have not been reported in Iowa fields, an increased need for herbicides is cutting into profit margins. The cost of herbicides for soybean has more than doubled in the last three years, almost entirely because of herbicide-resistant waterhemp. If Palmer amaranth is allowed to spread, those costs will continue to rise.

Anderson recommends farmers plant and harvest fields containing Palmer amaranth last in order to avoid spreading its seed. Soybean fields are key to scout late in the season, as Palmer amaranth will be easier to find above this crop than in corn.

“Weed experts need a period of time to adapt to new environments. There is no doubt Palmer amaranth will adapt to live in Iowa, so now is the time to go after it. We have the chance to eradicate it from most fields where it has been found, and greatly reduce the rate it spreads in the state. It would be a huge mistake to miss this opportunity.”
GREENHORN GRAZING
BUILDING KNOWLEDGE AND COMRADEY

Justin Rowe (second from left) has completed the Greenhorn Grazing program offered by Iowa State University Extension and Outreach and now hosts participants on his own farm. The class helps create community among producers as they learn from each others mistakes and successes.

Far Left: Extension livestock specialist Joe Sellers helped create the Greenhorn Grazing program seven years ago. He says the class isn’t just for beginners. “It’s open to any beef producer looking to network and upgrade management skills.”

“With nearly 20 producers surveying his land, Justin Rowe explains how he organized his newest pasture. Rowe is a graduate of the Greenhorn Grazing program offered by Iowa State University Extension and Outreach. He is now helping to instruct, provide information and networking opportunities to livestock producers across the state. This group is meeting in Madison County while another meets in Crawford County in western Iowa.

“It enjoyed my experience in the class and picked up ideas that have been helpful in my operation,” Rowe says. “In agriculture we need to help others, and share what worked and what didn’t work.”

Extension livestock specialist Joe Sellers (70 animal science, ’91 MS agricultural education and studies) was part of the group that designed the program and leads the group Rowe is addressing. “We call it Greenhorn Grazing, but this class isn’t just for beginners,” Seller says.

“It’s for anyone who wants to upgrade their management skills.” Greenhorn Grazing classes started in 2010 as a way to combine pasture walks and other meetings into a structured program. Since then, 12 courses have been held with over 260 attendees.

“You can see pictures in meetings, but then to go out into the field and see someone actually doing it. That makes it a completely different kind of experience,” says Brian Peterson, a retired state grassland conservationist with the Natural Resources Conservation Service and current president of the Southern Iowa Forage and Livestock Committee. “You can ask questions in this type of small group and get specific answers that pertain to your operation.”

Two or three classes are held each year around the state, combining the expertise of ISU Extension and Outreach specialists, producers and professionals from the agriculture industry and state agencies. Those partnerships are what makes the class so valuable to producers says Peterson (71 farm operations) who helps Sellers teach portions of the class.

“These partnerships help us tell the same story and work together toward the same goal, using our diverse expertise to mold the program into one great package,” says Peterson.

Participating with outside groups also helps Iowa State University Extension and Outreach specialists. “There are areas where new research is needed, like fencing systems or weed and brush control,” Sellers says. “When we don’t have resources at Iowa State working on those issues sometimes industry does. The combination of experts adds a lot of value to our participants.”

The class helps foster community among producers as they learn from both the mistakes and successes of their peers.

“Producers have different approaches to management and those interactions are important,” Sellers says. “A lot of comradery is being built. Many attendees have created informal networks to stay in contact after the class has ended.”

“I enjoyed my experience in the class and picked up ideas that have been helpful in my operation,” Rowe says. “In agriculture we need to help others, and share what worked and what didn’t work.”

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“Greenhorn Grazing is a great outcome if we can build on the college’s strengths, and ability to help future students.”

The college is known for one of the nation’s top programs of study abroad and the Charles and Christine Cornelius Global Endowment for Faculty Support.

“The goal is to raise $200 million for the College of Agriculture and Life Sciences. The college’s goal to raise $200 million will help grow six key areas: global agriculture, agricultural business and entrepreneurship, student and faculty enrichment, biosciences, sustainability and new innovative facilities for animal agriculture teaching and research. In strengthening these areas, the campaign will ensure the college continues to provide a world-class education that meets the needs of tomorrow’s students.”
The agricultural business program at Iowa State is recognized nationally for combining an exceptional education in business, management and economics with a range of hands-on learning experiences—from industry visits and internships to participation in study abroad and student activities like the number-one-ranked Agricultural Business Club in the nation.

Support for agricultural business during the Forever True campaign will strengthen the following areas:

Faculty support
Named faculty positions attract excellent faculty, keep their teaching on the leading edge, and provide time to serve as effective mentors for individuals and student groups.

“Establishing named faculty positions in strategic areas is essential to attracting faculty who will engage students’ curiosity, intellect and passion,” says Pete (’74 agricultural business) and Dana (’77 home economics education) Wenstrand, who established the Peter J. and Dana M. Wenstrand Harvest Fund to support the agricultural business program.

“These educators will play a critical role in increasing the profile of the program, and in preparing future business owners, managers and leaders for the increasingly dynamic marketplace.”

Student scholarships
Expanding support for scholarships and fellowships will keep an agricultural business education within reach and help recruit exceptional undergraduate and graduate students.

“Thanks to scholarships, I’ve participated in eight student organizations, experiences that have helped me make connections and strengthen my leadership skills,” says Catharina Iley, senior in agricultural business. “I’ve chosen internships and jobs for the quality of the experience, not just because a position pays well. I’ve also taken two study abroad trips. Scholarships have been one of the biggest contributors to my success.”

Sustaining leading-edge curriculum
From technology to international trade, agricultural business is constantly evolving; the program must continuously develop cutting-edge capstone courses and other curricula.

Capstone courses provide critical integrative learning experiences, and new funding will expand topics into areas such as business analytics, food market analysis, agribusiness management, international/global agribusiness and trade, agricultural policy, agricultural finance and farm management. Funding will also help develop new courses and curricula in emerging areas of expertise.

Growing the Agricultural Entrepreneurship Initiative
The Agricultural Entrepreneurship Initiative provides practical business development experiences that teach students to think entrepreneurially.

A gift from Keith (’59 animal science, ’63 PhD) and Virginia (’60 child development) Smith supports the Student Incubator Program, a key aspect of the Agricultural Entrepreneurship Initiative. Last year’s 14 participants developed a range of innovative ideas, from a solar-powered food dehydrator, to a real estate data management system, to a specialty beef business.

“Iowa State’s Agricultural Entrepreneurship Initiative is recognized as one of the best in the country. This is the Age of the Entrepreneur; students should know from their first day on the Iowa State campus that they can one day work for themselves,” says Roger C. Underwood (’80 agricultural business).

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