Welcome to our seventh edition of DISCOVER Careers in Agricultural and Biological Engineering.

This special issue of Resource is designed to showcase compelling opportunities in agricultural and biological engineering. Ag/bio graduates work in large and small companies—from alternative energy, food processing, and large-scale manufacturing to soil and water engineering, information technologies, and more. They spearhead international organizations and lead nonprofits, some focused on environmental quality, structural engineering, sustainability, forestry, or aquaculture. They do research and fieldwork and build academic programs. They respond to challenges.

From internships and studies abroad to careers where they are thriving, graduates are equipped as the next generation of leaders and professionals in an ever-changing global community.

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Agricultural and Biological Engineering Programs

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Kelsey Czyz, Penn State University

Jason Schuster, Iowa State University

Rebecca O’Toole, University of Florida

Gregory Fasick, Penn State University

Charles Parrish, North Carolina State University

Nicole Solitro, Purdue University

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Q. How about Energy?

A. Our society runs on energy, which is produced in many ways, including the combustion of fossil fuels like coal and gasoline. Too often, harmful substances are released when producing or using energy. These waste products cause air and water pollution and may contribute to global warming. Biological and agricultural specialists are developing alternative energy sources, such as plant-based fuels and solar power systems. These energy options may help sustain our quality of life while reducing adverse effects on the environment. These specialists also seek ways to conserve energy and improve the environment using current technology. Alternative energy is a growing field, and energy conservation will pose ongoing challenges for the future.

Q. What about Food and Bioprocess Engineering?

A. Food and bioprocess engineers work on the boundary where biology meets engineering. They combine design expertise with large-scale manufacturing to develop the processing methods needed by industry. They are experts in food pasteurization, sterilization, freezing, and dehydration as well as packaging, transportation, and storage of perishable products. They design bioreactors, fermenters, and other systems for the production of pharmaceuticals, vitamins, preservatives, and food supplements. These engineers also utilize biological organisms to produce energy, including fermentation to produce ethanol and anaerobic digestion to produce methane. Graduates in this new, rapidly expanding field pursue careers in food processing, medicine, biomedical engineering, environmental engineering, natural resources, agriculture, and related areas.

Q. Soil and Water Engineering?

A. Soil and water engineers study the interaction of plants, animals, and humans with soil and water. They seek ways to control soil erosion and reduce the effects of sediment and surface runoff on water quality. They design, build, and maintain drainage and irrigation systems for agricultural operations as well as water control structures for reservoirs, floodways, and channels. They also design equipment for applying fertilizers and pesticides. Soil and water engineers are experts in the principles of hydrology. They must also understand chemistry, environmental science, and the mechanics of water and wind erosion.

Q. Tell me about Standards and Safety.

A. Modern agriculture depends on mechanization, but these large machines can present hazards, especially when combined with long hours and solitary working conditions. Manufacturers strive to build equipment that is safe to operate and maintain by following industry-wide safety standards. Using injury data, field tests, and laboratory analysis, safety specialists study the use, and possible misuse, of agricultural machines, and help ensure the equipment’s compliance with safety regulations. To keep informed of new standards, they often participate in the organizations that develop these guidelines. Equipment manufacturers and government agencies employ safety specialists and engineers, and they often work as consultants.

Q. Information and Electrical Technologies Engineering?

A. As in other industries, information and electrical technologies provide agriculture with increased efficiency, reliability, and safety. Information and electrical technologies are used throughout modern agriculture, from radio-frequency identification collars on livestock, to electronic yield monitors and obstacle sensors on harvesters. The future of this field is very promising and includes combining computers and sensors with mechanical systems for automated harvesting and sorting of produce, and using satellite-based guidance systems and robotic actuators to create tractors and combines that steer themselves across the field.
with aquatic harvesting, sorting, and processing systems. Agricultural and biological engineers who specialize in water quality, biotechnology, power and machinery, natural resources, food processing, environment, and sanitation are well suited for careers in this expanding field. As natural fish supplies decline around the world, aquaculture is an area that will continue to grow.

**Q. Structures and Environment Engineering?**

**A.** Structures and environment engineers design and build greenhouses and animal housing, storage structures for food products, and waste handling facilities. In particular, these engineers design the systems that provide environmental control for these facilities, including ventilation systems and equipment that heats, cools, lights, reduces harmful emissions, and controls conditions in and around specialized agricultural facilities, such as plant growth chambers, bio-processing laboratories, commercial greenhouses, animal production facilities, cotton gins, grain elevators, and food processing plants.

**Q. Describe Power and Machinery Engineering.**

**A.** Modern agricultural machines must be mechanically sound and biologically sensitive, and onboard computers are becoming standard equipment. These machines are designed and tested by engineers educated in a power and machinery curriculum. To keep up with the growing demand for innovative, high-tech equipment, equipment manufacturers need more university-trained engineers. Farm equipment manufacturers commonly employ power and machinery graduates, but they also qualify for positions outside the farm equipment industry. Many have found engineering employment with other companies, including industrial facilities and manufacturers of construction equipment.

Thank you to ASABE member Paul Heinemann, Professor and Head, Penn State University Department of Agricultural and Biological Engineering, for his expertise and valued editing.

**Q. How about Environmental Quality Engineering?**

**A.** Environmental concerns are in the news: food processing plants are asked to reduce the pollutants returned to estuaries and bays, large-scale livestock production systems affect local water and air quality, and questions arise about the sustainability of the seafood industry. These and other environmental issues illustrate the opportunities available for engineering graduates who understand the Earth’s sensitive ecosystem and the biological and physical treatment of pollution. The demand for environmental engineering graduates has never been greater, because everyone must do a better job of protecting and improving the environment.

**Q. And Forest Engineering?**

**A.** Forest engineering applies physical, biological, and engineering skills to solving problems in natural resources and environment, forest production systems, and related manufacturing industries. Forest engineers are involved in a full range of activities in natural resource management and forest production systems, and their engineering skills and expertise are needed to address problems related to equipment design and manufacturing, design and construction of forest access systems, machine operation and erosion control, forest ecosystem management and improvement, and wood product design and manufacturing.

**Q. Explain Aquacultural Engineering.**

**A.** Aquaculture refers to raising fish and shellfish to sell as food and for other uses, such as ornamental and bait fish. Aquacultural engineers concentrate on increasing production while decreasing costs and environmental impacts. They seek ways to reduce pollution from aquaculture production systems, reduce excess water use, and improve ponds and other fish-rearing systems. They also work
A DEGREE IN AGRICULTURAL AND/OR BIOLOGICAL ENGINEERING can be a fulfilling and rewarding path. Creative challenges and diverse opportunities abound.

Many students delve into studies and research that leads to new solutions or the development of new products and processes. And education isn’t confined to formal classrooms. “What I want to be when I grow up” is often confirmed through internships—learning on the job—or studying abroad.

The students and career professionals on these pages have taken the ag and bio engineering path, and all affirm that it is the route to an exciting profession working in service to humankind. We hope you will be energized by their profiles that reflect their dedication to the profession and their interests.

Never Stop Learning

Aaron Vancura

Ord, Neb. / 23

Agricultural Engineering BS, 2014
University of Nebraska-Lincoln

Application Engineer
Industrial Irrigation, Hastings, Neb.

“I enjoy hunting and fishing—just being outdoors—and the really exhilarating sports: skydiving, scuba diving, mountain climbing, and spear fishing.”

I grew up on a farm and have always been enthusiastic about agriculture. That said, I also have a knack for math, science, and figuring out how things work. I put these two together, along with some helpful advice and a tour of UNL, and decided that I wanted to be an ag engineer.

My first “real” experience in engineering, however, was at the Nebraska Tractor Test Laboratory as a student technician. For three years—from my sophomore year through graduation—I maintained test equipment, set up and ran performance tests, and oversaw improvement design projects. I learned what I enjoyed within the engineering field.

At Vermeer Corporation in Pella, Iowa, as a design engineer intern on horizontal directional drills, I had a variety of assigned tasks. I not only honed my 3D modeling skills but also got a feel for the type of company that I wanted to work for after graduation.

In New Holland, Pa., at Case New Holland as a combine field test intern on flagship combines, my responsibilities grew—from maintenance of test equipment and combines to testing and data analysis. I traveled to Maryland and Louisiana for field testing, rounding out an experience with a larger publicly traded company.

Today, I am an application engineer at Industrial Irrigation in Hastings, Neb. Our main market as a distributor is for a variety of applications for industrial engines, including generator sets and irrigation power units. To be successful, I must multitask, work well under pressure, and pull from a diverse skill set. Duties range from design and test work to final assembly and interacting with customers. Strong people skills are a must.

My current employer put me on a plane to Spain for training—even before I graduated—to familiarize me with the hardware and software of the products a Spanish company offered. As a future employee, this helped me to hit the ground running when I started the job.

During a typical week, I test engines, wire control panels, create 3D models of parts, size and order various components for engine packages, and build frames for the engine packages. I travel to Maryland and Louisiana for field testing, rounding out an experience with a larger publicly traded company.

If you are considering ag/bio engineering, educate yourself through tours and conversations with people already in a program. If you will graduate soon—congratulations! When job hunting, ask questions about the prospective employer in your interview; it’s as much an interview for you as it is for them. Learn as you go!

My advice? Live every day like there’s no tomorrow, help those in need, be true to family and friends, and never stop learning.
Get a Degree, and then Get a Passport

Amanda Benoit
San Francisco, Calif. / 27

Biosystems and Agricultural Engineering MS, 2013
Michigan State University
Agricultural and Biological Engineering BS, 2010
University of Florida
ASABE Member

Food Technologist
Columbus Manufacturing, Hayward, Calif.

Why ag and bio engineering? The diversity of areas of study—from biofuels to food processing to biomedical! From the start, I could see myself having a long and rewarding career.

A speaker in one of my freshman engineering courses said, “A lot of people want to be doctors because they want to save lives, but a doctor can save only one life at a time. An engineer can save 1,000.” I was hooked because an understanding of agriculture and biology empowers one to solve problems that directly impact humanity.

I studied abroad in Osnabrueck, Germany, and toured different ag companies’ facilities. Inspired, I learned the importance of the engineering that goes into making food safe and available, and that prompted me to go to graduate school to learn more. I grew tremendously, traveling to different countries, and now I feel I can take on the world.

I also did an internship at the W.K. Kellogg Institute in Battle Creek, Mich., on the Advance Innovation Team, identifying and developing future foods and technologies. I evaluated the potential of an innovative cooking technology, collecting data using sensors and data acquisition instrumentation to determine the feasibility of scaling up. I presented the findings to a team of developers, managers, and engineers. The impressive results led to keeping me on the team part-time to perform further research while I finished my degree. I learned more about myself and about teamwork than at any other time in my life. It built decision-making and critical-thinking skills important to my job today.

On LinkedIn, I found my present job with a smaller company—Columbus—that is growing and learning, and I am growing and learning with it. Many skill sets are needed for troubleshooting a process, supply and demand issues, package size changes, and product/process optimization. However, when shopping at a store, it is incredibly satisfying to see consumers’ excited responses to a product or process that I worked on. That’s the whole reason why I put so much into my work: to inspire people.

The best occupation preparation was my internship and first job, which taught me how businesses run, what’s important to different audiences, and how to approach projects, issues, and people. You learn in industry what you cannot learn in the classroom or lab.

My ultimate goal is to provide simple, sustainable food solutions that will inspire people and communities around the world. I am on a mission to solve issues affecting humankind, specifically creating a continuous supply chain of food: increasing availability, minimizing waste, educating and holding people responsible. I am passionate about engineering and education and desire to drive a pipeline of engineers into the field to make the change that society needs.

WHAT MAKES A GREAT UNDERGRAD RESUME?

Good grades, of course, but also experiences—like internships and studies overseas—that build skills. Academic departments often have internship coordinators who match students with company openings. Alumni and employers often provide job descriptions directly to the faculty, hoping to find suitable interns. And most universities, and even some departments, host career days or fairs, where companies find candidates for internships and permanent employment. An internship typically involves hands-on work on real-world projects. Interns use the skills and abilities acquired in the classroom and get some exposure to the career opportunities that wait after graduation.

As our world becomes increasingly globalized, studying abroad is a great way to acquire cultural awareness. Study trips guided by professors may last a few weeks, or you can attend a foreign university for a full year. Students who study abroad come home with enthusiasm, experiences, and memories that last a lifetime.

"Camping, hiking, bicycling, kayaking, snowboarding? Count me in! But if I want grrrrreat, I travel to experience different cultures and try new foods!"
Amy Moncus

Lexington, Ala. / 33

Biosystems Engineering BS, 2006
Auburn University

Soil Conservationist
USDA-Natural Resources Conservation Service, Moulton, Ala.

Auburn University felt like home when I first visited the campus. Biosystems engineering intrigued me, and the first time I sat in the computer lab and connected with my classmates, I knew I was right where I belonged. The degree program brought classes I enjoyed, down-to-earth professors who cared about my success, lifelong friends, and a wonderful career. And I met my husband and best friend, Mack, as well!

There are many avenues within biosystems engineering, but natural resources is my path. I interned at the state office of the USDA Natural Resources Conservation Service in Auburn and continued part-time until I graduated, assisting state engineers with designs and tracking information on watershed dams. I was trained and mentored by excellent engineers.

I was offered an ag engineering position with the NRCS Bay Minette Field Office as a conservationist and planner. I bring a technical background but do designs for conservation practices, too. I work with producers to carry out conservation practices through the NRCS Environmental Quality Incentive Program (EQIP) via watering facility designs and conservation plans for grazing lands, and then make field visits to ensure the installation meets NRCS standards and perform practice certification.

“...We met through biosystems engineering and our love of the land. Mack was a leader in the Auburn ASABE student branch, and I was active in it as well. We realized we had a lot in common!”

Mack Moncus

Lexington, Ala. / 32

Biosystems Engineering BS, 2006
Auburn University
ASABE Member

Project Engineer
TTL, Inc., Decatur, Ala.

Like Amy, I knew I made the right decision to pursue biosystems engineering when I started at Auburn. Every professor had an open door and welcomed students for questions, investing their time willingly. I learned how to learn and broaden my horizons, and choose a career path that suits me individually.

I interned with the Seed Technology Center in Auburn, cleaning silos between shipments of grain. I bagged seeds, stacked, and then organized pallets to be used for research. I was an undergrad assistant as well, working with research in variable-rate technology for fertilizer spreading, and silt fence sediment reduction. I ginned cotton and separated seeds from lint in yield studies. And I traveled to Freising, Germany, for study at the Technical University of Munich, assisting with the investigation of a smart bearing for application in a self-propelled forage harvester. The smart bearing provides real-time data to an operator: radial load, load angle, balance, and rpm of any axle with the bearing mounted. I collected data with different loads, speeds, positions, and angles, and was challenged to be efficient and precise as well as think outside the box. Accurate data collection is the basis for all engineering work.

Today at TTL, I work on a variety of projects—deep foundations (auger cast pile installation), groundwater monitoring, asphalt design for roads, foundation inspections, and construction material testing data review. And I obtained my professional engineering license while raising two kids, giving 110% to a full-time job, and building a house. Amy gave me the time to study whenever we could find it.

We met at a meeting of the ASABE student chapter. I first noticed her sitting at a table alone—an opportunity! I introduced myself, and she didn’t give me the time of day, but I persisted. The group took several trips, and because of our studies and our love of the land, we started dating. We spent enough time together during ASABE events to realize we had a lot in common. We attended a student rally in Kentucky, won the Student Chapter of the Year award, and returned to Auburn to roll Toomer’s Corner in victory!

Our biosystems education and ASABE not only brought us together but also taught us to balance a work schedule and complete tasks on time. If I had a personal mission statement, it would be “Work hard, start on time, and end on time.” Amy would agree with this. Hard work pays off, and dedication to a degree program, a work project, or a relationship—it sets you apart.
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Best Job Prep?
Outside the Classroom

Andrew Towey
Sandwich, Mass. / 22

Biological Systems Engineering BS, 2015
Iowa State University

Process Development Engineer
Renewable Energy Group, Ames, Iowa

In high school, I worked on a small farm in Cape Cod, Mass., where my enthusiasm for ag grew. Searching college programs, I got excited about engineers working with biofuels. Proficient in math and science with a specific interest in biology, biological systems engineering clicked with me—and I discovered ISU offered a biorenewable emphasis. (The emphasis of ag and biosystems engineering departments varies widely, so it is crucial that your interests and the department’s align.) Although I am passionate about renewable fuels and environmental stewardship, I also love Jeeps, which are not known to be the most fuel-efficient vehicles. That said, my father and I rebuilt and modified a 1999 Jeep TJ, one of my cherished possessions.

While at Iowa State, I signed on with the National Science Foundation Research Experiences for Undergraduates, Forest Bioproducts Research Institute in Orono, Maine. As part of a research team that investigated the feasibility of producing bio-oils using biomass from forest and paper industries, I determined a series of ternary diagrams for mixtures of water, furfural, levulinic, and formic acid. I also set up a Rousselet Robatel UX 1.3 Mixer-Settler system, and created the operation procedure manual for this system in the lab. I traveled to Concepcion, Chile, to present the work at the Unidad De Desarrollo Tecnologico. I visited the University of Concepcion, an industrial lumber manufacturing facility, had lunch with the Mapuche—the indigenous people of Chile—and took in the local culture. Immersed in a different culture, it’s extremely humbling to see how many people outside of the U.S. are bilingual.

I also interned with Renewable Energy Group (REG) in Ames to evaluate a patent-pending glycerin refining method. I used lab-scale equipment to replicate and refine the patent process to see if any expansions could be made to the patent before the application deadline. I successfully presented my findings to the CEO and company executives.

Now full-time at REG, when people ask about my job, I can say, “It’s classified!” I work on projects that involve patents and technologies—intellectual property. Generally, however, my projects involve the pretreatment of feedstocks used to produce biodiesel, either lab or pilot scale.

In school I learned how to problem solve and reach for applicable resources. However, the best job preparation was outside the classroom, participating in internships and BioBus, a student organization that takes used cooking oil from a dining center on campus and converts it to biodiesel for the campus bus system. I learned a great deal of technical knowledge in college, but it takes internships and work experience to understand how to successfully apply that knowledge in industry.
Find the Magic, Feed the World

Brunno Cerozi
José Bonifácio, Sao Paulo, Brazil / 28

Soil, Water and Environmental Science PhD, 2016
University of Arizona
Animal Science and Pastures MS, 2012
Agriculture Engineering BS, 2008
University of Sao Paulo

I am from Brazil, a world leader in agriculture—a multibillion dollar industry with many job opportunities. I spent my childhood days on my grandfather’s bountiful farm, and my father and I went fishing every weekend. My pastoral country and family influenced my pursuit of ag engineering and now, aquaponics at UA. Ag engineering feeds a hungry world, and what can be more important than that?

As an international student, I encourage studying abroad. It opens the mind and doors to learning and future careers. Exposure to different cultures, languages, and opinions brings academic as well as personal development. I received scholarships from both my country and UA, the latter competitively awarded based on commitment to interdisciplinary research and communication. I will go back to Brazil eventually, grateful for what my days in the U.S. have taught me, and hopeful that my research will be applied to more sustainable food production systems around the globe.

I am a hobby magician and have traveled several times to Las Vegas—the magic capital of the world—to perform on the streets. After flashing my cards, people ask, “How did you do that?” I believe that ag engineering is like the joker in a deck. The joker can substitute for any card—just like an ag engineer can do so many things! An ag engineer’s knowledge is broad, and his or her career options are tremendous.

Think Critically for Simplicity

Bushra Manzar
London, Ky. / 17

Biosystems Engineering BS, 2015
University of Kentucky

In my undergraduate studies, as I learned more about the “different” sciences, biological and physical sciences became less and less mutually exclusive, and their horizons merged for me. The different realms of science always seem to complement each other without fault!

I like solving problems, creatively brainstorming with others, and thinking independently as well—all important activities for future biosystems engineers. Knowing my interests, my older sister—a stem cell researcher—influenced my decision to pursue biomedical engineering as a specialization within my biosystems degree. I am applying to medical school this year because I want to use what I’ve learned in engineering—thinking critically and reducing problems to the simplest form—in a medical setting.

I started college when I was twelve—somewhat unusual! I loved my major and, despite my age, quickly made friends. Regardless of your birth date, though, you have to hit the ground running freshman year. My brothers, Shahid and Zahid—16 and 14—have a shared passion for math and biology, and they received their degrees with me this spring in biosystems engineering as well. I suppose we are very young graduates!

All three of us were all fascinated by our senior design projects, which solidified much of what we studied over the course of four years at UK and brought all that we’d learned down to a simple biosystems directive: find the optimum solution to implement the design!

“Future ag engineers will have to rethink the way we ‘do’ agriculture. We will have to be bold and fearless, responsible for the third Green Revolution.”

“Being the team leader for my senior design project was exhilarating. With the design project now a memory, those in my graduating class are headed for jobs in industry, continuing on to graduate school, or poised to pursue a PhD or MD—just like me.”
When You Persevere, ‘No’ Turns to ‘Yes’

Caleb Lindhorst

Lindsey, Neb. / 22

Agricultural Engineering BS, 2016
University of Nebraska-Lincoln
ASABE Student Member

Lindsey, Neb., is home to 321 people and the Zimmatic pivot. During my freshman and sophomore summers, I worked as a test engineer for the Lindsay Corporation where the Zimmatic, made for high-performing irrigation systems, is manufactured.

Being from a small ag-focused farming/manufacturing community and a family of farmers, the love of the land is instilled in me—I have soil in my veins! No question about my major. Ag engineering merged my interests in math and science with my roots. I met other like-minded students in the program, also interested in developing new, more efficient technologies to lessen our carbon footprint and feed the Earth's growing population. I believe we are headed to an electronically driven ag era to reduce environmental impact, and I take classes that prepare for this.

Unfortunately, after the fall of my junior year, I was involved in a motor vehicle accident that left me in a coma for 39 days and institutionalized for a year of rehab. I had a traumatic brain injury after being ejected during a gravel road rollover. When I woke, my left side was paralyzed, my speech all but gone, and I couldn't walk, talk, or even eat. Some said I would not be able to return to college and regain my former life. I didn't accept that; my faith kept frustration at bay and my farm-bred perseverance moved me forward. I have returned to my academic path with awesome support of family and friends.

Ag engineering, like my life, is a challenging path. You never give up! Get involved early with student organizations. Check out the ASABE International 1/4 Scale Tractor Student Design Competition. As a team co-captain with my best friend Luke Prosser, we were given an engine, two tires, and terrific teammates to design and build a small-scale tractor. With this fascinating project, I think I received the equivalent of two years work experience!
Stay Active to Stay Sharp

Carson Geib

Columbus, Ind. / 22

Agricultural and Biological Engineering BS, 2014
Penn State University

Manufacturing Development Program
Cummins, Columbus, Ind.

From my hometown of Lititz, Pa. (voted coolest small town in the U.S.!), I headed to Penn State with a love of the outdoors, engines, and big machinery. I literally stumbled across the ABE department searching for a major and took a tour. I saw a hydraulics lab, a room full of engines, and big machinery. The list of core classes included machinery systems and a minor in off-road hydraulics lab, a room full of engines, and big machinery. I literally stumbled across the ABE department searching for a major and took a tour. I saw a

My grandfather taught me, ‘If you’re gonna do ‘er, do ‘er good.’ The same goes for ag engineering: do it right and give it 100% effort. It will change your life.’

While in school, I played rugby in a national championship game as a freshman. And we won! As a junior and senior, I strength trained, played racquetball, and hiked the state game lands around State College. I found that physical fitness had a direct correlation with how I was doing in school. It helped to keep me sharp.

Today I am full-time at Cummins in a leadership development program focused on the manufacturing function but can also complete rotations in product engineering, supply chain, finance, marketing, and more. My future options with this company look exciting. I am doing four six-month rotations in various manufacturing avenues: the first stint in global manufacturing engineering and the second now, as a test team manager responsible for employee safety, engine quality, and daily production numbers to be met in engine testing. This is a one-of-a-kind opportunity, challenging me to manage people in a very technical role.

While in school, I played rugby in a national championship game as a freshman. And we won! As a junior and senior, I strength trained, played racquetball, and hiked the state game lands around State College. I found that physical fitness had a direct correlation with how I was doing in school. It helped to keep me sharp.

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Working on engineering projects in college, playing team sports, and getting involved in student ASABE leadership has brought me this far, and I am on the way to even more.

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A Job Description is Just the Start

Cassy Gardner
Vacaville, Calif. / 24

Biological Systems Engineering BS, 2013
University of California, Davis

Automation Engineer
Banks Integration Group, Vacaville, Calif.

I work at a consulting firm and help clients (mostly large biotech and pharmaceutical companies) automate their manufacturing processes. Not only do I learn about how life-saving drugs are manufactured, I take part in the process. Clients come to us with difficult issues that require creative solutions. We address their needs through varied hardware and software applications. Most of my time is spent programming and documenting solutions. I also travel to client job sites, which is somewhat akin to being on the set of “How It’s Made.” Travel days are spent installing and testing our solution, which can be high stress, but is ultimately the best part. You see your handiwork in action! I enjoy the client-vendor relationship and especially seeing our customers pleased with what we provide.

At work, I have also taken the lead on an internal, company-wide initiative, which has been very motivating. The initiative aims to improve the company’s technical practices and culture via employee-led projects. I facilitate and help generate ideas for internal projects and bring them to fruition. I’m a people person, and this a great leadership opportunity. It’s different from engineering but something I like.

Believe it or not, I also do taxidermy! Yes, the one with the dead animals. A high school teacher introduced me to it, and it led to a part-time job during college. The UCD Museum of Wildlife and Fish Biology hired and trained me to prepare specimens to be used in scientific studies. My role focused on feathered creatures, and I have prepped birds of many sizes: from hummingbirds to great horned owls. As with engineering, I came to appreciate the beautiful, miraculous cycle of life when interacting with it in a creative way.

Find Your Sweet Spot

Charles Parrish
Raleigh, N.C. / 24

Biological Engineering BS, 2015
North Carolina State University

ASABE Student Member

As a junior in biological sciences, I encountered the concept of biomimicry: applying natural solutions to human design challenges. After all, Mother Nature maintains a 3.7 billion-year track record iterating “endless forms most beautiful and most wonderful,” as Darwin said. Realizing that I wanted to translate my knowledge of biological patterns into designs for regenerative systems, I changed majors to bio engineering. My degree transfer was validated when I was selected for a NC Space Grant Scholarship to intern with the Advanced Life Support Group at NASA Kennedy Space Center.

Our project focused on developing rapid pathogen detection and sanitation protocols for the Vegetable Production Unit (Veggie), in which astronauts grow fresh produce aboard the International Space Station. To determine methods for optimal pathogen detection and reduction in a microgravity environment, we employed molecular biology techniques including microbial culturing, DNA extraction, and real-time quantitative polymerase chain reaction.

A second NCSG scholarship funded my internship in bio and ag engineering at NC State to design an anaerobic digester, a bioreactor that utilizes microbes to process biomass into biofuel and fertilizer, for planetary surface habitat life support. My subsequent senior design project involved bench-scale experiments to evaluate biogas yield for simulated inputs under certain conditions. This past July our senior design team attended the ASABE annual meeting in New Orleans, where I presented our first paper on the project.

I plan to pursue a graduate degree in bio engineering or a similar field. I’ve found meaning in bio engineering, and I aim to continue performing work to improve our sustainability on Earth while preparing for the “next giant leap” for humankind.
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Putting It Together (After Taking It Apart)

Devin Mangus

Kanorado, Kan. / 24

Agricultural Engineering, concurrent BS and MS, 2015
Kansas State University
ASABE Student Member

Advanced Technical Support
John Deere, Des Moines, Iowa

Whether old or new, I enjoy troubleshooting and restoring mechanical, hydraulic, and electrical systems on our farm equipment, which formed my early interest in power machinery. In high school, I wanted to be a calculus teacher, but when my catapult design won first place at a state Science Olympiad, I decided my desire to work around farm machinery, apply learned science, and face new challenges was better served as an engineer.

I knew I had made the right decision to become an ag engineer when I was offered an internship with John Deere as a field test engineer because of my practical knowledge of hydraulic and electrical troubleshooting. As a freshman and with only three weeks of engineering classes behind me, John Deere saw potential in me.

My engineering abilities developed with five separate John Deere internships in product design, testing validation and verification, manufacturing systems, product marketing and business development, and customer support. Initially, I worked in Augusta, Ga., on compact utility tractors as a field test engineer, testing design improvements made to components for the next model year. My second summer in Augusta, I developed a hitch assist control to raise and lower the three-point hitch from outside the tractor to make coupling of implements and trailers to the tractor quicker, easier, and safer. Once unveiled, the hitch assist was awarded a silver medal at the world’s largest trade fair for ag machinery and equipment in 2013—Agritechnica in Hannover, Germany. My third internship was very different: I worked as a manufacturing engineer in Waterloo, Iowa, on four-wheel-drive tractors, developing a tool crib inventory system, where tools and replacement parts could be checked out, that automatically notified the crib superintendent when supplies needed to be reordered.

For a role “outside” of engineering, I took an internship in global dealer development in Des Moines, Iowa, where I developed a standardized assessment to measure dealer performance that was used in all product markets. Creating a standard for measuring dealerships was a global collaborative effort between cross-functional groups, various countries, and cultures. My last internship in Olathe, Kan., was in customer support, conducting new software training and new product awareness in every dealer region from the Texas panhandle to the northern Nebraska border and from eastern Colorado to the Mississippi River.

Now, more than ever, is an exciting time in agriculture. Precision ag has become a focused discipline as farmers are turning to advanced technologies to increase machinery uptime and performance while decreasing operation costs with fewer inputs. While technologies help producers save money, these advanced systems require a high level of understanding to fully utilize their proven potential because of the very complex interactions between the soil, crops, and machinery, which agricultural engineers understand.

Nothing beats farm work with Mother Nature on speed dial. And personally, an antique tractor can run all the apps I need. But I am eager to continue working with sensing platforms to capture data in ways not previously studied and possible in agriculture. R&D is stimulating and challenging!
**Think Globally**

**Ellen Bornhorst**

Houghton, Mich. / 26

Biological and Agricultural Engineering PhD, 2016, MS, 2013
Washington State University
Biosystems Engineering, Food Engineering concentration BS, 2011
Michigan State University

Education is more than just grades. In addition to excelling academically, it’s important to be globally aware and give back to the local and world communities through volunteering and professional service. As an undergrad, I was involved with the MSU chapter of Engineers Without Borders. This experience confirmed the complexity of global issues, especially in developing countries, and the importance of good communication in solving international problems.

As the world becomes more interconnected, especially in the food industry, the ability to work with both professionals and laypeople is important, which is why I pursued experiences in Peru and Puerto Rico. An intensive six-week study abroad in Cusco included a home stay with a Peruvian family, classes in Spanish and Peruvian history and culture, and weekend trips to cultural and historical sites. I still marvel at the Incan architecture! My time in Peru helped shape my outlook on world challenges—pollution, climate change, and hunger. I also volunteered for an alternative spring break in Puerto Rico, doing community service in El Yunque National Rainforest, which demonstrated the complexity of environmental issues and the key role education plays in solving globally interconnected problems.

My professional goal is to conduct research that challenges me intellectually and advances solutions to current societal needs for a safe, high-quality food supply. I hope to conduct research on the application of novel processing technologies to improve the safety, quality, and nutritional value of food.

“For my senior capstone design project, my group teamed with John Deere to redesign and reconfigure the tractor cab HVAC system—to repackage and study airflow to optimize efficiency while reducing noise emission. We hope that future capstone teams will continue to build on the design.”

**Equip for Your Development**

**Jason Schuster**

Zwingle, Iowa / 22

Agricultural Engineering BS, 2015
Iowa State University
ASABE Student Member

For nine months, on a cooperative experience with John Deere in Waterloo, Iowa, I served as a manufacturing engineering intern in 9R tractor final assembly, overseeing a variety of projects including the relocation of a robotic cab weld operation, the design and installation of a kitting system to support material flow to the assembly line, and layouts of factory material racks. I also served as a manufacturing support engineer during 7R/8R new product builds and other line optimization projects. Factory layouts use AutoCAD Architecture, so I taught myself how to use the software to better succeed at my internship. My experiences brought me back for a second internship with John Deere, where I served as a product engineering intern and specifically worked with the 9R product line. I performed tests to ensure customer satisfaction, analyzed CAN bus data using various software, traveled to a test site to inspect customer products, and served as 9R tractor support during new product introduction.

I am now pursuing an MS, with research in advanced machinery engineering, specifically harvesting machine optimization. I aim to gain a better understanding of global machine systems and methods of optimization and efficiency. After graduate study, I hope to return to John Deere for a career in the agricultural equipment industry.

The biggest challenge today is to grow, feed, and produce more while using less. Ag and bio engineers are some of the best qualified to take it on. It is up to my generation to feed a world population predicted to reach nine billion by 2050.
Grow With and Within a Company

Jessica Hart

Greenwood, Ark. / 26

Biological Engineering BS, 2012
University of Arkansas

Project Engineer
BlueInGreen, Fayetteville, Ark.

During my senior year, I interned with the company where I now work and researched ozonation for color and odor removal in water. Because the company was young and developing new products, I helped with R&D on technologies we sell today. It is awesome to see a product go from paper to full-scale installation. I continue to build on what I learned as an intern, taking a product from inception to finalizing, working on everything: prototyping, pilot testing, data analysis, and even some marketing. It’s very satisfying to see something you’ve invested your time and energy in take off.

Two University of Arkansas professors, aiming to merge Henry’s Law with modern technology to more efficiently dissolve gases into liquids, founded BlueInGreen. There is no “typical” day at the office. Employees wear many hats. Flexibility is key! You might find me at my desk writing a proposal or designing a treatment system, testing equipment in the field, or working in the R&D lab.

My current focus is water reuse and removal of pharmaceuticals and endocrine disruptors from wastewater before it enters the environment and re-enters the water distribution system.

College gave me the foundation to be a good engineer; experience gave me the ability. I have always seen myself in an environmental field—“saving the world”—and that is what I’m doing now. With installations across the globe, BlueInGreen continues to grow and evolve as a company, along with me, protecting the water we all share every day.

"In high school, I had three female science teachers to whom I attribute my career choice. Having intelligent, motivating female STEM teachers made me love science and helped me realize that there was no reason I couldn’t succeed in any engineering field, even those fields typically dominated by men."
Seize Opportunities

Jessica Lay
Broken Arrow, Okla. / 26

Biosystems Engineering MS, 2012, BS, 2010
Oklahoma State University
ASABE Student Member

While finishing my master’s degree, I met a water quality division manager at the annual Oklahoma Governor’s Water Conference and Research Symposium, where I gave a presentation on my research. The manager suggested that I pursue an internship in construction permitting while finishing my master’s program. (Professors always say that conferences are a great way to network and meet potential employers—and that’s exactly what happened for me!) The internship led to full-time employment in the public water supply section, where I performed water treatment plant inspections, provided technical assistance to operators, and so much more. It was exciting!

However, my most rewarding experience thus far was a rainwater harvesting research and construction project in Sierra Leone with a Fulbright grant. I implemented my pilot-scale research results to a full-scale community project with many people involved in the process. When I returned a year later to check on the system, the local school teacher told me that the children no longer suffer from vomiting or diarrhea thanks to drinking harvested rainwater! I am currently working with colleagues to produce a technical manual for this system and will return to Sierra Leone, hopefully soon—my fifth trip!

I love to hike, explore the Arizona wilderness, and grow great food for delicious meals to share with family and friends, just the way my Italian grandmother taught me: with love. While we eat, we talk and drink delicious wine. Aquaponics makes this possible in Tucson.

Taking the Scenic Route

Joni Lee Giovanna Hesley
Oracle, Ariz. / 52

Agricultural and Biosystems Engineering MS, 2015
University of Arizona
Education K-8, MEd, 1997, Fiber Arts Fibers, BA, 1989
Arizona State University

After my husband’s passing four years ago, I returned to school to finish my engineering degree. I took a circuitous route, beginning the degree decades ago. I completed the engineering core in 1983 but then moved on—to England—to help run a small farm as well as a bed and breakfast. When I returned to Arizona ten years later, I finished an undergrad degree in fiber arts and worked as an artist. As the daughter I had in England became school age, I worked on my master’s in education. My engineering background made me highly qualified in math and science. I taught middle school for the next decade as my daughter grew through the grades.

Today, with my background in STEM and an MS in agricultural and biosystems engineering, I have begun consulting with schools, businesses, and communities on how to design, install, operate, and sustain aquaponic gardens. I am part of a team working toward garden certification for aquaponic produce to be used in school cafeterias.

I enjoy collegial conversations with my peers, professors, and particularly a group of aquaponic enthusiasts from several colleges who meet once a week to discuss research and create a base for collaboration. Yet, I would like to travel the world, assisting in implementation of community aquaponics systems for food production and education. When I visit a school or grower to consult on growing hydroponically with treated fish effluent, I am surprised by the variety of good questions they ask. I have been able to find the answers or the people who can help—very satisfying!—and I hope to continue this exciting, challenging work.
If Opportunity Knocks, Open the Door

Kaley Core
Spencerville, Ohio / 22

Food, Agricultural, and Biological Engineering BS, 2015
Specialization in Food Engineering
The Ohio State University

Associate Process Engineer - Corporate
Hirzel Canning Co., Ottawa, Ohio

Food engineering was an obvious choice for me—a combination of all of my interests: food, engineering, math, and science. I was incredibly fortunate that I had terrific engineering internships at a food processing plant. I learned so much and could not have asked for a better opportunity or a better fit for me.

My first summer at Hirzel Canning Co. brought numerous responsibilities—training on an aseptic filling machine, learning about and programming PLC systems, and familiarizing myself with the equipment, plant layout, and data collection for research. In my second summer, I worked on instrumentation—temperature sensors, pH meters, pressure sensors, and conductivity meters. At the beginning of tomato season, I saw all of the plant in operation. It was fascinating! I also worked at HCC’s plants in Pemberville and Northwood, where both tomatoes and sauerkraut are processed. I am very excited to have a full-time position with HCC now!

One of the greatest challenges facing students today is finding balance between classes, work, and involvement in outside activities. When interviewing for internships and full-time positions, companies want to see not only grades but also work experience, involvement in clubs, and volunteer work. It can be difficult to prioritize activities and get everything done. In my last semester of college, I took 16 credit hours, spent 12 to 15 hours a week working as a teaching assistant, played softball with my intramural team, was involved in our ASABE chapter, and helped with department recruitment events for prospective freshmen. With companies wanting students to be well rounded, work/life balance is imperative.

I highly recommend becoming involved in an ASABE chapter above other choices. The people that I met, the friends I made, and the opportunities that I had through ASABE made my college experience.

It’s a Balancing Act

Kara Johnson
Santa Clara, Calif. / 24

Bioengineering PhD, 2018
University of California, San Diego
Genetics BS and Biological Systems Engineering BS, 2013
University of California, Davis

I didn’t realize until after I started grad school and worked with students from other programs how well my bio engineering degree prepared me for the world. It made me a versatile, competent student via academics and life skills learned—networking, team building, presenting and project planning, and finding work/life balance.

In the short term, my goal and that of any graduate student is to graduate! Down the line, I would like an industry position in R&D and eventually in project management. While I would like to climb a few rungs of the corporate ladder, I also have a passion for STEM education in K-12.

My motto is, “Chance favors the prepared mind.” I seek opportunities that prepare me to further these goals—attending professional development seminars, networking with individuals in positions I would eventually like to hold, and immersing myself in problems I am eager to solve. I would also enjoy managing a nonprofit focused on science education and curricula development for STEM in K-12 classrooms or exploring creative solutions for problems in bimolecular engineering—projects that have widespread impact on health either directly or by facilitating research.

A twofold problem: most people don’t know what bio/ag engineering is, and it’s difficult to explain the breadth of our field and the various career paths it offers. You may find a dream job and have someone question the name of your major. Speak up, defend its value—you have the skills needed. It’s up to us to make a reputation for our profession!

“That’s me (far left) in Honduras for a study-abroad: humanitarian engineering design. The children were by far the best part of the trip!”

“Outside of study and research, I take and teach gymnastics classes; swim, dance, and am active in the Bioengineering Graduate Society as Alumni Liaison and Coordinator for Home Run Challenge (an event at the San Diego Festival of Science and Engineering).”
Who brings engineering to life?

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Graduate Programs
Candy McBride
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Undergraduate Programs
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Keep an Open Mind on Your Options

Kari Andrist

Bloomington, Minn. / 22

Bioproducts and Biosystems Engineering BS, 2014
University of Minnesota

Assistant Environmental Engineer
Burns & McDonnell, Bloomington, Minn.

During my last two undergrad years, I worked at 3M as a product responsibility liaison technical aide. My job focused on the regulatory side of engineering; I worked with research engineers, keeping tracking of necessary regulatory documentation for chemicals and products under development. Additionally, I spent my senior year working as a research assistant in the Air Quality Lab at the University of Minnesota. I aided research on two main projects regarding air quality in the livestock industry. For one project, I tested a new biological filter medium—a mix of corncobs and shale—to treat air from barns. Another project addressed pit foaming in deep pits at swine barns, which has contributed to a number of explosions in recent years. My primary roles included sample collection, running various tests on the samples, and assisting in the development of a standard operating procedure for future sample testing.

Though very busy my senior year, I spent countless hours browsing the web for job openings. I was fortunate to stumble upon a job posting for the environmental position at Burns & McDonnell I now hold.

For this position, I spend a considerable amount of time on sites performing construction management services for various projects during summer months when construction is in full swing. In the winter, most days are spent at my desk, working primarily on projects in the solid waste industry. Many of these projects are based at landfills or recycling facilities. Recently, I’ve focused on landfill hydrology, including leachate treatment and the handling of stormwater runoff. I have also assisted with a number of recycling rate studies, including work for the states of Texas and Minnesota.

Solid waste is not an industry most people initially want to get involved with—myself included! I had no interest in this area during college, and I was surprised to find myself diving into it on my first job. So far, I’ve been involved in a number of challenging, interesting projects. One of my favorites was the recycling rate study for Minnesota. I was involved from start to finish, and it was very satisfying, after months of hard work, to see the final product successfully out the door. My time at 3M gave me a solid background in regulatory work and basic knowledge of working with regulatory agencies. I’ve found that internship experience is useful, time and again, as many of my projects involve work with regulatory agencies.

In the future, I would love to get involved with remediation work. My passion has always been on “the water side” of environmental work—groundwater in particular. Hopefully, I will be able to focus on that during my upcoming master’s program in civil engineering.

“This is one of three bronze bulls on the UM campus representing a focus on agriculture. It’s a photographic rite of passage. You haven’t lived until you have a picture with one of the bulls!”
Hands-On “Aha!” Moments

Kassie Coverdale
Lafayette, Ind. / 22

Agricultural Engineering BS, 2015
Concentration in Machine Systems
Purdue University

My first two years of college, I struggled. I put so much work into my studies, but I wasn’t seeing the results I wanted. Most of all, I missed working with my hands. After my sophomore year, I joined the Purdue Utility Project team, a global team that designs and builds off-road vehicles that can be constructed in sub-Saharan Africa with locally available materials. I worked over the summer for my professor as an undergrad researcher, conducting tests on existing vehicles, redesigning the frames, and making modifications in the shop to fix issues I discovered during testing. I corrected the steering of one of the vehicles that pulled hard to one side—no one could figure out why, but I discovered the problem. I reworked the entire front suspension system—cut into the frame and constructed a new system to support the front strut and steering assembly—and it was a success! That’s when I knew I was in the right place. I just needed to see real results—that my time and effort toward my degree was worth it. I stayed on the team and loved my “hands-on” major from then on. Check out https://engineering.purdue.edu/pup/.

After my junior year, I worked for Wright Implement, a John Deere dealership in Crawfordsville, Ind. In the service department, I processed inventory data and worked closely with the senior service technicians to inspect, evaluate, and repair large agricultural equipment and implements.

However, my heart was in the African utility vehicle, and as testing and design innovation leader on my team, I traveled this past summer (my first-ever trip to Cameroon!) to implement our new Practical Utility Platform (PUP) vehicle. Purdue has taken teams every year since 2009, and I was thrilled to experience Africa, passport and skills in hand.

Most villagers and farmers in sub-Saharan Africa have no way to transport their goods to market, so crop waste has been estimated at 40% to 50%. This means that money that could be used to improve their lives literally rots in the fields. Furthermore, access to drinkable water is a struggle; women and children have to carry pots of water back and forth over outrageous distances. Our vehicle is significantly cheaper than any existing alternative, and it can carry up to 2000 lbs of payload in one trip, a huge improvement on the current system of manually carrying crops and water. Additionally, we added external attachments that mount on the vehicle—a water pump, maize grinder, grain thresher, belt-driven generator/welder, no-till planter, and field cultivator. These attachments turn our vehicle into a portable power unit to significantly improve the lives of the village as a whole.

I am so incredibly grateful to have traveled to Africa and seen first-hand the impact our project has on villagers there.
Inspiration for Problem-Solving?
Look Around!

Kathryn Gray
Madison, Ind. / 26

Biosystems Engineering MS, 2013, BS 2011
University of Kentucky

Manufacturing Engineer
Altec Industries, Elizabethtown, Ky.

My goal?—to be a problem solver. The variety and scope of topics to problem-solve in biosystems engineering are extremely relevant—topics that are in the news today.

I love my big Southeastern Conference school with its small biosystems department of motivated students and faculty. It gave me exposure to many types of challenges within a terrific curriculum. Today, I can quickly triage situations and dive in with a well-rounded engineering solution.

During my sophomore year, I got involved in research with an opportunity to be part of a cross-discipline team working on lignocellulosic biofuel production. That team evolved into the group with whom I did my master's research. I set my own schedule, keeping the group informed of my work. I was also an engineering intern for Vehicle Service Group in Madison, Ind. As an engineering representative for a cross-discipline brand comparison team, I contributed to prototype development and responded to customer issues. The communication skills I learned in both jobs are utilized on a daily basis in my current position.

Between my freshman and sophomore years, I spent six weeks in Karlsruhe, Germany, taking Calculus III. I lived with a host family and visited engineering facilities—an incredible experience forcing me out of my comfort zone. I didn't know the language or the people I was traveling with, but I would return tomorrow if that was an option! A highlight was being in Munich after Germany defeated Portugal in the Eurocup quarter finals. In Kentucky, we get excited about basketball, but compared to an entire country celebrating? Wow!

Harness the Power of Giving

Kevin Edwards
Little River-Academy, Texas / 23

Biological and Agricultural Engineering MS, 2016, BS, 2014
Texas A&M University

I've learned the power of helping people. Growing up, I was taught to lend a helping hand, but throughout my college years I really learned what this means. Through my work with student clubs, I've been able to help students at Texas A&M and beyond.

In my intro bio/ag engineering class, I learned about several departmental student clubs. I was immediately intrigued by the 1/4 Scale Tractor team—the Aggie Pullers. I quickly got involved and became close to many upperclassman and faculty members. The family-like atmosphere of the bio/ag engineering department and degree program captured me. I knew this is where I belonged, to learn and to help.

I served as president of the Aggie Pullers, and a week before the ASABE competition, a neighboring school (Lamar University) contacted me for a helping hand. They had a completed tractor, but funds had run out, and their team wasn't going to make it to Peoria. We were able to fit the Lamar tractor into our trailer and haul it for them. It had been several years since Lamar had a team, and we were as honored to help as they were grateful. Each year since, Lamar has grown more competitive. However, the 1/4 Scale Tractor competition isn't just about the prize—it's about learning and pulling together.

Ag/bio students face competition with other engineering disciplines, and some companies have never heard of ag/bio engineering. But companies that hire ag/bio students always come back for more. I ask students at recruiting events, “What field of study will always be there?” The answer is agriculture. It puts food on the table, clothes on our backs, and becomes more important every day. You won’t meet a more humble group who knows what it means to help out and not expect anything in return.

“Texas A&M’s ASABE student chapter sponsors a spring lawnmower tune-up—changing oil and spark plugs, cleaning the air filter, and sharpening the blade. That’s me, earning a few bucks toward funding the club’s travel to the ASABE Annual International Meeting.”
Focus on the Big Picture

Lauren Delaney

Rockford, Ill. / 23

Agricultural and Biological Engineering BS, 2014
University of Illinois at Urbana-Champaign

Research Associate
Novozymes, Franklinton, N.C.

Students often struggle with finding relevance in what they do. In engineering, it’s easy to get lost in math, physics, and chemistry courses and lose sight of the future within the field or beyond. On a similar note, it’s easy to get overly focused on studying for a test or making an A and forget to look at the bigger picture. Engineering is more than studying hard enough to pass a class. It’s about learning to identify the most relevant problems and creative solutions. Students and professionals in ag and bio are in a unique position to directly address the diverse and complex problems facing today’s growing global population. It’s one of the branches of engineering that requires the most ingenuity, and the hardest to define.

I completed two internships with Novozymes during university summers. I got my foot in the door by working with a U of I grad student on a project sponsored by the company. During my first internship, I conducted research on the effectiveness of various enzymes on grain sorghum for fuel ethanol production. During my second, I learned about near-infrared spectroscopy (NIRS) and helped build models to analyze various samples related to the fuel ethanol production process. These internships gave me a chance to prove myself in a low-risk environment and led to a full-time job offer before I graduated. My education gave me the basics and taught me how to learn, but my internships got me on track to hit the ground running once I started full-time at Novozymes.

Find Your Own Design

Mark Greve

Rochester, Minn. / 23

Bioproducts and Biosystems Engineering BS, 2014
University of Minnesota

Junior Scientist
University of Minnesota, St. Paul

When I visited UM as a high school senior, the campus tour leader described her major—bioproducts and biosystems—and I was instantly interested. She encouraged me to sign up for a one-credit intro course, and I fell in love with the BBE major subplan in environmental/ecological engineering. Later on, surveying on a stream during a class field trip and learning other basic assessment methods, it felt incredibly right. Then, working for the professor who led the trip, I saw a design I had produced near the north shore of Lake Superior brought to life in that beautiful landscape. I was hooked!

I worked for the university for a summer after my junior year on projects pertaining to water quality, collecting data on streams, and working on a design for a retention basin for the ski hills near Lutsen, Minn. I designed a catchment that served about 40 acres and reduced the amount of sediment reaching the nearby Poplar River by about 75%. I also developed a watershed model for the entire lower Poplar River basin that estimated the amount of water and sediment delivered to the river based on slope, soil type, land cover, and rainfall intensity.

After graduation, the professor asked me to stay on to help coordinate his projects. I planned to take a year off and head to grad school the following year—perfect timing!

After finishing an MS, I will aim for a professional engineering license, perhaps work at a private consulting firm, and finally reach for a research professorship at a university to teach the next generation of engineers.

“I work for a world leader in bio-innovation. Novozymes, a global biotechnology company, is all about industrial enzymes, micro-organisms, and biopharmaceutical ingredients. My field is first-generation (grain to fuel) bioethanol production. New challenges abound!”

“My main focus is water quality and preservation, specifically an experimental bioreactor design that incorporates a new growth medium and a new carbon source that will be installed in a moving stream bed as a low-maintenance solution for removing nitrates from stream water.”
Build a Network and Get Involved

Mariana Madrigal Martinez

Novi, Mich. / 22

Biosystems Engineering BS, 2015
Michigan State University

Entry Level Manager
PepsiCo/Frito Lay, Wooster, Ohio

Funny story! As a Society of Women Engineers (SWE) co-chair for a banquet themed “An Evening with the Industry,” various company sponsors joined SWE for festive feasting, PepsiCo among them. The next day, with a PepsiCo company representative, conversation started to flow. He asked if I would attend an informational session PepsiCo was hosting at the MSU Union. I received an interview on the spot and was invited to the second round of interviews at their plant in Wooster. Who knew that planning a dinner with industry would bring me an internship with Frito Lay—and the job I now have!

It was a summer internship packed with learning, and I was offered a permanent position after returning from rollout presentations in Dallas. I was honored to be the only senior in my engineering department who had a full-time job waiting after graduation—before senior year even began! The takeaway: get involved! Through clubs, sororities, travel abroad—connections happen!

My study abroad is the classic tale of an opportunity falling in your lap. The first MSU Costa Rican trip was planned for a winter break. The plane was full, but someone had to pull out. Being fluent in Spanish and very interested in other countries, two days after turning in my last final, I found myself on that plane to Costa Rica. Paired with current biosystems engineering students from Universidad de Costa Rica, we met researchers and professionals in anaerobic digesters, biofuels, and renewable energy. It was an amazing introduction to biosystems engineering, and as the youngest in the group, I had the most to learn about ecological engineering in the tropics. When I returned, the connections we made brought more opportunities for me in translating and organizing biodigester and wetland reports from doctoral researchers.

As a mentor to young female engineering students, I emphasize getting involved beyond the classroom, broadening your horizons, increasing your viability as an engineer, and so much more.
Hands Down, Perspective Matters

Matraca Steen

Sherburn, Minn. / 22

Biosystems Engineering BS, 2015
North Dakota State University

Production Engineer
Archer Daniels Midland Marshall, Minn.

I chose biosystems engineering as my major because I have a passion for science and all things agricultural. I grew up on a farm, the daughter of a biology teacher, and biosystems engineering is a great blend of my background, interests, and personal goal of converting the grains I grew up around into even more usable products for consumers.

Internships were defining moments for me—affirmations of my chosen major and career path. My first interning opportunity was a National Science Foundation Research Experience for Undergraduates at Virginia Tech in Blacksburg, Va. I spent the summer working under a professor, doing research in bio-based plastics. My lab partner and I conducted experiments, read published articles to aid in our research, and ended the summer with a poster session discussing our results.

My second internship experience was with Archer Daniels Midland as a production engineer intern. I worked in a corn processing plant on projects for safety improvements, cost savings, and chemical savings. My knowledge base grew, and I gained practical experience in a plant setting. One of the biggest takeaways from this experience was the importance of plant safety and continually improving safety practices.

To round out my resume, I also took two study abroad courses, both faculty led. The first was a spring break trip as a freshman to Austria, Hungary, and Slovakia for a history course. The second was a 17-day journey traveling through China for an animal science course to study global food systems. Both of those experiences created memories that will last a lifetime.

From passport carrying and suitcase toting, I learned that the world is increasingly more connected, and as an aspiring engineer, getting input and perspective from different people is extremely valuable, building a global and cultural awareness. These two trips instilled in me a love for travel, which I hope will continue throughout the rest of my life.

As an aside, whenever and wherever I go, I get a picture of myself doing a handstand. I coach gymnastics and enjoy anything involved with the sport, even seeing myself “upside down” in foreign countries. It’s all about getting new and exciting perspectives—any way you look at it!
Play to Your Strengths

Mathieu Ricard
L’Assomption, Qc, Canada / 28

I own Irrig-Expert, a company specializing in the design, sale, and installation of agricultural irrigation systems. The range of products we offer allows our customers to realize their dreams—a pumping station, center pivots, self-propelled rail, linear underground pipes. My company team is young and dynamic, and our mission is to offer our agricultural clients a product that exactly meets their needs.

During my degree program, I interned as a technical representative for Hortau, a new irrigation monitoring company. They weren’t offering internships at the time, but I was so interested in learning more about irrigation that I talked them into trying me out as an intern. I installed probes and data loggers on farms, tested prototype equipment, and represented the company at a summer show. I traveled around the province but was based at St. Romuald near Quebec City.

When I graduated, I found a job with MacDon in Winnipeg as a field test technician. I visited 16 states during my six-month contract. The position involved traveling, and it brought me my first plane flight! I flew dozens of times throughout the U.S. and Canada to test different prototype and preproduction hay equipment. However, I was usually alone in my truck with just my tools, and it was an amazing adventure: on the freeways occasionally, but more often on two-lane highways in out-of-the-way places that held much charm.

When an opportunity came to start my own company, specializing in center pivots was a natural. There was a need in Quebec—no distributor of center pivots in the entire province! I brought site-specific calculation and design into play, using the right pump station, optimal pipe diameter, and efficient flow for the soil culture.

This is my dream job—working in the field, applying theoretical concepts to optimize yield, making my own schedule, and traveling!

Raised to Believe “I Can Fix This”

Michael Faison
Hubbardson, Mass. / 23

I grew up in Boston and Orlando, where agriculture is not really “seen” in the traditional sense. The driving factors that led me to ag engineering are not based on growing up near farms or production facilities. I wanted to be an engineer before I even knew what engineering was! Creative as a child, I could craft anything from assorted materials—at six years old, an entire city of cardboard boxes!—and I could fix just about anything with a little elbow grease. In addition, as I grew older, my heart was continually stirred by those with less. For many years, my grandmother funded a child in a faraway country by providing the means for his food, shelter, and education. Like so many in third-world countries, he didn’t have the opportunities or amenities I enjoyed, and I was always circling around the question, “How can I help fix this, not for just him, but for so many others in similar circumstances?”

I found the answer through agricultural engineering: career creativity that is often paired with serving the less fortunate. I did an internship with the USDA National Resource Conservation Service as a soil conservationist in Defuniak Springs, Fla., aiding the district conservationist with monitoring in-place conservation practices—row cropping, gully design, runoff structures, residue percentage, wells, checkout, forest services, and more. This experience in the Florida panhandle was mind opening, and it showed me my future in creative solutions coupled with serving others.

Now graduated, I have been blessed to work for a great engineering firm, Kiewit, and I’m just beginning as a field engineer. I have always had a strong interest in infrastructures and water control facilities, which involve creative problem-solving approaches for the good of people. I can’t get any closer to what I imagined for my life.

“I attended Florida A&M University because it offered the program I dreamed of, and it is ranked among the historically black colleges and universities (HBCUs).”
Get Informed and Stay Informed

Melissa DeSantiago

Walterboro, S.C. / 24

Biosystems Engineering B.S., 2014
Clemson University

CHCI/STEM Public Policy Fellow
Washington, D.C.

Upon graduation from Clemson University, I was one of twelve selected nationally for the Congressional Hispanic Caucus Institute (CHCI) Public Policy Fellowship, where I fulfilled a nine-month fellowship in Washington, D.C., working in the federal service and linking my engineering background to the public policy realm.

As the CHCI STEM Fellow, it was my goal to gain firsthand experience and apply my background to impact current environmental issues. My first placement was with the U.S. House Committee on Science, Space, and Technology, where I experienced how that committee has significant jurisdiction in areas within biosystems engineering. I witnessed legislators discuss climate change, the future use of fossil fuels, and space exploration. (I also noted an unfortunate disproportion of engineers or STEM professionals represented in Congress.)

Later, I transitioned from Capitol Hill to fulfill a second fellowship at the Department of the Interior in the Office of the Secretary. Under the direction of Secretary Sally Jewell, I took part in research for policy advisors on a wide array of issues, including reauthorization of the Land and Water Conservation Fund, which manages and safeguards public lands. Understanding the science behind the issues proved advantageous.

Work in federal service allowed me to gain interdisciplinary skills in the public policy realm. However, my biosystems engineering background remains key to the work I hope to do in the future.

CHCI’s mission is to develop the next generation of Latino leaders. I pursued this opportunity in the nation’s capital because it is essential to be well informed on public policy, as it will always play a critical role in society. It is also essential to continue making strides in incorporating all types of professions in the legislative process. The role that we, as agriculture and biological engineers, have in government is indispensable, and with our expertise we can make significant contributions to create policies, beginning with research and including the implementation of designs.

During the CHCI 37th Annual Awards Gala, I was highlighted as one of the few Latinas in STEM and spoke in front of hundreds of attendees and leaders on the need for a more interdisciplinary approach to achieve important national goals. I spoke directly after Minority Leader Nancy Pelosi! Check out this clip, which was shown before I took the podium:
https://www.youtube.com/watch?v=aUwavYKkDzI.

Because of my undergraduate education and experiences, I have a strong desire to remain focused on environmental protection. In graduate school this fall, I hope to resume the work that I love, contributing to improving the quality of life through research to promote healthy and sustainable communities.
Prove Yourself: Ask Questions

Paige Friedrich

Boonville, Mo. / 22

Agricultural Systems Management BS, 2014
University of Missouri-Columbia

Parts Employee and Training Coordinator,
Sydenstricker Implement, Tipton, Mo.

At the end of my sophomore year, I interned with Sydenstricker Implement in Mexico, Mo. I worked in the parts department and as a training coordinator. I helped ship parts for transfer to other branches of Sydenstricker Implement and was in charge of signing up employees for training classes through John Deere University. In the latter role, I met with every salesman, service advisor, and parts manager to discuss which classes would be suitable for the employees. I traveled to six different stores throughout Missouri and worked with employees for enrollment in the training courses.

The following summer, I was a maize product development intern with DuPont Pioneer at the research station in Miami, Mo. I assisted with all research projects at the station involving pollinating corn, taking plot counts, and detasseling corn. At the end of my summer with Pioneer, I presented data on brittle stalk to a group of Pioneer employees in Johnston, Iowa.

After interning with Sydenstricker, I knew this would be a great company to keep in touch with during my undergraduate years, and maybe apply for a job after graduation. I kept in contact with the store manager at the Tipton location. When he invited me to become a full-time employee, I was sold. Encouraging words from my advisor confirmed that this would be a great company to work for, so I began my career with Sydenstricker and have enjoyed it ever since.

Because I interned with this company, I brought some experience with me. Having knowledge of “how things are done” and already knowing other employees’ names put me ahead—along with my drive and determination to learn and work hard. I arrive at the Tipton store at 8:00 a.m. every day and work on various jobs within the parts department—finding parts for transfer, helping a customer or technician locate parts for sale, or scanning in parts from a stock order. I’m kept very busy. If not in the parts department, I work on my computer checking employees’ training records. Each employee is responsible for completing a certain amount of training hours through John Deere University. All new employees have to take training in their work area, whether it’s sales, parts, or service. My job is to enroll them in these classes and answer any questions they have. It’s also my job to facilitate the live instructor-led classes that John Deere offers.

Working in the equipment industry has many different avenues, and I’m glad I chose a career that makes my college degree directly applicable. I wake up excited every day, looking forward to seeing my coworkers and customers. Sydenstricker is like one large family, and I’m grateful to be a part of it. My long-range goal is to move up within Sydenstricker—to be more knowledgeable with all John Deere parts, training, and equipment in general. I prepare every day to achieve that goal, not afraid to ask questions, try new things without being asked—to prove that I can think on my feet and can get things done!

“Agriculture is challenged and tested every day, and as a person with an agricultural background, degree, and career, I am committed to standing up for ag!”

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http://asm.missouri.edu | 1-800-995-8503
The Culture Comes First

Rachel Kurzeja

Rochester Hills, Mich. / 21

Biosystems Engineering BS, 2015
Michigan State University
ASABE Student Member

Manufacturing Engineering Associate
General Mills (Yoplait plant), Reed City, Mich.

My internship experiences helped me discover my passion for working in engineering and showed me that the most critical component of being happy and successful is not the job itself but how a company values its people. I identify with General Mills’ company culture and values: “Do the right thing all the time” and “Grow and inspire.” These values facilitate working and collaborating in a challenging and dynamic environment and enable me to make a positive impact. The company culture within General Mills provides opportunities for employees to grow together as engineers and professionals.

My internship and co-op experiences include working for Perrigo Company as a production engineering intern in Allegan, Mich., and for DePuy Synthes Joint Reconstruction as a shoulder product development co-op in Warsaw, Ind. As a production engineering intern, I worked in a tablet manufacturing value stream and led a plant-wide continuous improvement project from creation through implementation. I was given autonomy, resources, and opportunity to present regularly to upper management and operators about my project. I grew as an engineer and in leadership skills.

As a co-op, my job was similar to an entry-level engineer. I supported project engineers and ensured progress and timeline. This helped me to further develop my communication skills, ability to work with a team, and strong work ethic.

My biggest takeaways from these experiences are to always be open-minded, remembering that opportunities come in all shapes and sizes.

Seek Uncharted Waters

Sergio Baravalle

Temperley, Buenos Aires, Argentina / 32

Biological and Agricultural Engineering MS, 2015
Washington State University
Supply Chain Management Certificate, 2015, MIT
MBA, 2012, Torcuato Di Tella University
Molecular Biology MS, 2007, University of Buenos Aires

I am currently working on three interrelated projects: one for my thesis, one for a competition, and one based in Argentina. My thesis attempts to “rethink equality,” aiming to redistribute resources from rich to poor areas—moving “rich” waste as a resource to develop a poor area of my homeland. My selected area is an arid one with naturally polluted subterranean water, the only source of water in the region. By collecting and transporting agricultural waste, it is possible to produce enough energy to pump, purify, and irrigate—creating a positive environment with social and economic impacts. I named the concept “bioequality.”

I love trekking and am awed by lakes, glaciers, and woods. However, I have witnessed the destruction of many landscapes and have understood since I was a child that sustainability is not generally considered when uninformed business people make decisions about the land!

My path was not a typical one. I wrestled with different areas of interest before deciding to apply my knowledge of biology, business, logistics, and engineering to develop sustainable solutions. I received an MS in molecular biology, was hired by Merck (the German chemical company) and GE. While working for them, I completed an MBA focused on developing sustainable solutions for agricultural production in Argentina. A Fulbright scholarship provided me with the means to complete an MS in biological and agricultural engineering. Concurrently, I completed a certificate course in supply change management with a scholarship from MIT.

After much education, I am back to my main concern: avoiding destruction of nature by creating functional solutions to very complex problems. The complexities of global challenges require a multidisciplinary approach with attention to technologies, economy, social impact, governance, and innovation.
Dedication Brings Many Rewards

Shannon Brown

Oahu, Hawaii / 23

Biomedical Engineering PhD, 2018
Agricultural and Biological Engineering BS, 2014
University of Florida

Doctoral Researcher
University of Florida

I’m a PhD student at the University of Florida in the J. Crayton Pruitt Family Department of Biomedical Engineering. I transferred from ag/bio engineering (undergraduate) to biomedical engineering (graduate) to apply my biological engineering background in a field that would advance the quality of life.

In high school, I loved calculus, but it was not satisfying just to study math or physical sciences. I was fascinated by the complexity of biology and human physiology, although admittedly I didn’t know the first things about them. So, for my undergraduate degree in biological engineering, I put the two together: math and biological science. Along the way, my knowledge of these subjects grew, and accordingly my interests developed. I picked up minors in biomechanical engineering and nutritional sciences that allowed me to explore subjects that excited me most.

I personally financed my college experience, so I pursued every scholarship for which I was eligible and worked part-time jobs. The effort paid off (literally), as I received numerous small scholarships from my department, from both colleges in which my department was housed, from ASABE, and from Tau Beta Pi, the national engineering honor society.

An internship at RTI Surgical solidified my desire to pursue the medical sciences, particularly orthopedics. I’m going straight for a PhD because I thrive in the research environment, and I’m not deterred by going back to school for a long haul.

Additionally, I was awarded three fellowships that make me proud to be a graduate student: a National Science Foundation Graduate Research Fellowship, a Pittman Fellowship from the Institute of Cellular Engineering and Regenerative Medicine (ICERM), and a Graduate School Fellowship from the University of Florida.

Dedication is an important trait for my job. PhD research is taxing, especially when balancing it with other activities—volunteering, coursework, writing, and life. The students who seem to enjoy it most are willing to stay late, show up on weekends, and tolerate sometimes-tedious work. When I’m not in the lab, I’m hiking in the natural areas around Gainesville or doing power yoga. I also foster for the local greyhound rescue group during summers and participate in K-12 outreach programs during the academic year. And I love baking for my friends! Although work fills most of my hours every day, the rewards are great and the results can make a substantial impact on society, so being results-driven also makes this a satisfying position.

If you want to excel past your peers in this field, it takes sacrifice. Get ready to buckle down. Bioengineering is basically core engineering plus pre-med coursework, and it can be cutthroat. That said, if you emerge on top, it is truly valuable and an indication of your efforts.

“I’m currently researching drug delivery platforms for knee joints and cartilage. Ultimately, I hope to improve the therapy for osteoarthritis, a degenerative disease that affects over 27 million Americans and is the most prevalent form of arthritis, the nation’s most common cause of disability.”
Play To (and With) Your Strengths

Taylor Brady

Yuba City, Calif. / 25

BioResource and Agricultural Engineering BS, 2012
California Polytechnic State University (Cal Poly), San Luis Obispo

Engineering Manager
Orchard Machinery Corporation (OMC), Yuba City, Calif.

I grew up in Holtville, Calif., a small-town ag community. Since a young age, I have always been in a shop cutting, welding, and building things that were highly influenced by agriculture.

When it came time for college, I decided that if I was going to spend the rest of my life doing something, I should enjoy it. That’s where engineering came in. When I discovered BioResource and Agricultural Engineering (BRAE) at Cal Poly, it was like hitting the jackpot. Being a BRAE major opened a door for me to have my passion flow effortlessly into a career I would enjoy for a lifetime.

OMC caters to a niche market that specializes in tree shakers for the nut harvesting industry. I joined their team in 2012, and I’m fortunate to work with people who continuously invest in me, challenge me, and put me through an accelerated learning curve, so my knowledge and expertise have grown exponentially over the last three years.

We are currently in transition because of the new EPA requirements for Tier 4 emissions, which will require major design changes: engine packages will be larger and the chassis redesigned to accommodate space constraints. Manufacturers are looking for alternative solutions—more efficient hydraulic systems requiring less power.

OMC’s environment provides freedom for growth, innovation, and progressive advancement. I have the satisfaction of being able to imagine, design, and create parts in SolidWorks, and then watch them come to life in the shop as they’re fabricated into a functional piece of machinery. We are continuously perfecting the design along the way, striving for ease of manufacturing without ever sacrificing quality.

Push Beyond Your Comfort Zone

Thomas Marchetti

Recklaw, Tex. / 21

Biological and Agricultural Engineering BS, 2015
Texas A&M University

My advice to a freshman beginning a bio/ag degree program? Reach out to peers, professors, community members—cultivate connections. Try new experiences—do research, tackle internships. And visit new places—other cities, states, and countries—study abroad!

I was a summer research intern at Kansas State focused on field-based high-throughput phenotyping, with crop breeders, plant pathologists, biologists, bioinformaticists, and engineers working together to streamline the process of gathering physical crop data to shorten the crop improvement timeline for drought/heat tolerance, disease resistance, and yield increases. The group I worked with specialized in wheat improvement, but the system can be applied to corn, grain sorghum, and other crops.

In the global marketplace, it’s important to experience other cultures. Top companies often look for international experience in job candidates. During my undergraduate years, I traveled to Scotland for a course on U.K. Natural Resources and Agricultural Sustainability, and I spent five weeks in Brazil on a faculty-led program based in Rio de Janeiro. That latter suitcase event included two important petroleum and mechanical engineering courses and visits to Furgo, a manufacturer and operator of subsea UAVs; to a Bohemia distillery, and to ONS, the control center for the Brazilian power grid.

In short, excellent engineers are well rounded! Biological and agricultural engineering is a diverse field with broad possibilities. Prepare to take your place in the world community to help solve very relevant problems.

“As an undergraduate engineering research intern, my role was to help with aspects of data collection—programming, sensor calibration, testing, and georeferencing a study plot with a GPS.”
Scratching the Itch to Create

Tyler Niday

Encinitas, Calif. / 26

BioResource and Agricultural Engineering BS, 2012
California Polytechnic State University (Cal Poly), San Luis Obispo

Research and Development Engineer
Orchard Machinery Corporation (OMC), Yuba City, Calif.

I am a private pilot and currently fly a Mooney M20e. Flying is one of my passions, and I take to the sky for work and pleasure. I also love surfing, snowboarding, and music. My boss says I’m very artistic for an engineer—free-spirited, out of the box, creative, quirky.

As a Cal Poly freshman business major, I happened by the ag engineering shops housing two tractors, one powered by two blown hemi engines and the other by an Allison V-16 aircraft engine. I love building things and found out that the BRAE department is very hands-on, so I switched my major. As a senior with a post-graduation job already in hand, I made another switch. At a career fair, I was blown away by OMC—a company all about new things that has a manufacturing facility with state-of-the-art automated equipment.

When I started at OMC, there was talk about creating an autonomous shaker without GPS. In dense orchards, a satellite signal can’t provide enough accuracy due to canopy cover. We just went for it and built a sensing apparatus to automate the shaker machine. I love seeing an idea turn into a finished product!

When you shake a tree, each individual limb on the tree has its own natural frequency, and the nuts fall off when the limb hits that natural frequency. With our FAST (Fully Automated Shaker Technology) system, the machine holds a set rpm for a set duration, ramping up and down through the rpms or slowly ramping up to the desired frequency. Recently, I prototyped this new machine in Australia. We had great results—a more thorough shake in less time.

‘One Size Fits All’?—Not for My Clients

Véronique Gagnon

Ham-Nord, Qc., Canada / 27

Agricultural Engineering BS, 2011
Université Laval

Consultant
Groupe Conseils Agro Bois-Francs (CCAE)

During the first year of my degree program, an engineer who specialized in designing farm buildings presented his work to students. Voilà!—this was what I wanted to do! However, upon graduation, I accepted a job more focused on water management and soil conservation. I like working in the fields, and the position was created just for me!

The agri-environmental advisory clubs (CCAE) are voluntary groups of agricultural producers. They provide members and customers leading-edge expertise in agri-environmental issues and support the implementation of sustainable agricultural practices.

In the field, I’m in work clothes, with hands and boots full of mud. Although I spend time at the computer, I’m not a typical engineer in a pristine office!

As a consultant, my work has varied scenarios—from creating specifications for a soil conservation project to lessen erosion (visiting the site, preparing plans, and supervising construction) to identifying drainage problems and finding solutions with a visit to a farmer’s fields. Aerial photos and elevation maps along with soil profiles are used to identify problems, and I’m then able to make recommendations to correct water management issues. I often prepare drainage plans after an on-site visit for soil sampling, which helps to identify how a field should be drained, with which drains (grade, length, depth, capacity), and the required spacing.

I met my husband while working on the Laval ASABE student chapter’s 1/4 scale tractor design team—an unforgettable experience! He is also an ag engineer, works for an ag machinery company, and understands my work. We have a lot of common interests, one being our 15-month-old son.
I have had a keen interest in water resources issues and the contemporary global water crisis since I was 15, and I knew I wanted to be a hydrologist as soon as I understood what that career path entailed. I had the necessary math skills to succeed, and I knew that the biosystems engineering path would equip me with a great many more skills and versatility than, say, environmental science or natural resource ecology. I have since grown as a student and future professional, and I have been challenged by my program at every turn.

From my first semester at Oklahoma State, I was impressed with the tight-knit, welcoming nature of the Biosystems and Agricultural Engineering department. I was especially excited about the department’s commitment to creating opportunities for undergraduate research and the dedicated participation in ASABE student design competitions, particularly Fountain Wars. I have been a member of OSU’s Fountain Wars team for all four years of my undergraduate career!

I have received numerous scholarships during my time at OSU, including a major academic achievement award given at the university level to National Merit Scholar finalists. This past summer, I received the ASABE Robert E. Stewart Engineering Humanities Award at the Society’s Annual International Meeting in New Orleans.

There are some important, prestigious scholarships available to undergrads that open doors. But opportunities and dreams don’t depend on a magic formula or accolades. Dedication to schoolwork and networking through actively engaging in the local student branch of ASABE can swing doors wide open, and people will take note of your passion.

The summer after my freshman year, I worked as an undergraduate research assistant. I helped a handful of graduate students with whatever they needed done and assisted them with their experiments. It wasn’t the most glamorous work, but I think my skills and knowledge improved by a greater degree in that one summer than at any other time. I worked on an incredibly diverse array of projects, both in the lab and in the field. By the fall semester of my junior year, I was ready to take on a project of my own. I was put in charge of monitoring the performance of an experimental bioretention cell in the OSU Botanical Gardens. I was involved in every step of that project—from developing the setup and experimental procedures, to actually running the setup through data analysis and communicating the results. My experience in what it takes to conduct research has cemented my interest in being involved in research in my future career.

Ag/bio engineers can take on an incredibly versatile range of work. With all the different options and emphases available in undergraduate degrees, an ag/bio engineering student or graduate who understands just how much they are able to accomplish has gotten past a significant hurdle! In my soil/water engineering emphasis, I find this variety exciting, rather than frustrating, because it means there is always something new to discover, always room for improvement to develop new and better ways of, for example, analyzing stream systems—or whatever the focus may be.

Editor’s Note: Since 1987, the ASABE Foundation has provided opportunities to ensure that agricultural and biological engineering continues to prosper. Scholarships are granted to promising students, like Lizzie Hickman below, who are enrolled in agricultural or biological engineering programs. Interested? Check out www.asabe.org/foundation.aspx or contact Darrin Drollinger, ASABE Executive Director, at drollinger@asabe.org.
The list below comprises U.S. and Canadian schools with ABET- and CEAB-accredited programs offering degrees in agricultural and biological engineering. Contact them directly for more information. School representatives or admissions advisers can answer your questions and arrange a campus visit for you. Before you go, try to schedule a separate appointment with the engineering department. Prepare to be impressed!

**UNITED STATES**

**ALABAMA**
- Auburn University
  - BioSystems Engineering
  - Auburn, Ala.
  - www.eng.auburn.edu/bio

**ARIZONA**
- The University of Arizona
  - Agricultural and Biosystems Engineering
  - Tucson, Ariz.
  - cals.arizona.edu/abe

**ARKANSAS**
- University of Arkansas
  - Biological and Agricultural Engineering
  - Fayetteville, Ark.
  - bio-ag-engineering.uark.edu

**CALIFORNIA**
- California Polytechnic State University
  - BioResource and Agricultural Engineering
  - San Luis Obispo, Calif.
  - brae.calpoly.edu
- University of California, Davis
  - Biological and Agricultural Engineering
  - Davis, Calif.
  - bae.engineering.ucdavis.edu

**COLORADO**
- University of Colorado – Boulder
  - Chemical and Biological Engineering
  - Boulder, Colo.
  - www.colorado.edu/chbe

**COLOMBIA**
- Florida A&M University
  - Biological and Agricultural Systems Engineering
  - Tallahassee, Fla.
  - www.famu.edu/cesta/main/index.cfm/academic-programs/undergraduate-programs/biological-and-agricultural-systems-engineering

**FLORIDA**
- University of Florida
  - Agricultural and Biological Engineering
  - Gainesville, Fla.
  - abe.ufl.edu

**GEORGIA**
- University of Georgia
  - Biological and Agricultural Engineering
  - Athens, Ga.
  - bae.engineering.uga.edu/agricultural-engineering

**HAWAII**
- University of Hawaii
  - Biological Engineering
  - Honolulu, Hawaii
  - www.ctahr.hawaii.edu/site/ProgramBE.aspx

**IDAHO**
- University of Idaho
  - Biological and Agricultural Engineering
  - Moscow, Idaho
  - www.uidaho.edu/cals/abe

**ILLINOIS**
- University of Illinois at Urbana-Champaign
  - Agricultural and Biological Engineering
  - Urbana, Ill.
  - bae.illinois.edu

**INDIANA**
- Purdue University
  - Agricultural and Biological Engineering
  - West Lafayette, Ind.
  - www.purdue.edu/ABE

**IOWA**
- Iowa State University
  - Agricultural and Biosystems Engineering
  - Ames, Iowa
  - www.abe.iastate.edu

**KANSAS**
- Kansas State University
  - Biological and Agricultural Engineering
  - Manhattan, Kan.
  - www.bae.ksu.edu

**KENTUCKY**
- University of Kentucky
  - Biosystems and Agricultural Engineering
  - Lexington, Ky.
  - www.uky.edu/abe/undergraduate-areas-of-study

**LOUISIANA**
- Louisiana State University
  - Biological and Agricultural Engineering
  - Baton Rouge, La.
  - www.bae.lsu.edu

**MASSACHUSETTS**
- Massachusetts Institute of Technology
  - Chemical and Biological Engineering
  - Cambridge, Mass.
  - web.mit.edu/cheme/research/areas/biological.html

**MICHIGAN**
- Michigan State University
  - Biosystems and Agricultural Engineering
  - East Lansing, Mich.
  - www.egr.msu.edu/abe

**MINNESOTA**
- University of Minnesota
  - Bioproducts and Biosystems Engineering
  - St. Paul, Minn.
  - www.bbe.umn.edu/bae

**MISSISSIPPI**
- Mississippi State University
  - Agricultural and Biological Engineering
  - Mississippi State, Miss.
  - www.abe.msstate.edu

**MISSOURI**
- University of Missouri
  - Bioengineering
  - Columbia, Mo.
  - bioengineering.missouri.edu
NEBRASKA
University of Nebraska–Lincoln
Biological Systems Engineering
Lincoln, Neb.
bse.unl.edu

NEW YORK
Cornell University
Biological and Environmental Engineering
Ithaca, N.Y.
bee.cornell.edu

NORTH CAROLINA
North Carolina A&T State University
Chemical, Biological, and Bio Engineering
Greensboro, N.C.
www.ncat.edu/academics/schools-colleges1/coe/cbbe

North Carolina State University
Biological and Agricultural Engineering
Raleigh, N.C.
www.bae.ncsu.edu

NORTH DAKOTA
North Dakota State University
Agricultural and Biosystems Engineering
Fargo, N.D.
www.ndsu.edu/aben

OHIO
The Ohio State University
Food, Agricultural and Biological Engineering
Columbus, Ohio
fabe.osu.edu

OKLAHOMA
Oklahoma State University
Biosystems and Agricultural Engineering
Stillwater, Okla.
bae.okstate.edu

OREGON
Oregon State University
Biological and Ecological Engineering
Corvallis, Ore.
bee.oregonstate.edu

PENNSYLVANIA
Penn State
Agricultural and Biological Engineering
University Park, Pa.
abe.psu.edu

SOUTH CAROLINA
Clemson University
Biosystems Engineering
Clemson, S.C.
www.clemson.edu/degrees/biosystems-engineering

SOUTH DAKOTA
South Dakota State University
Agricultural and Biosystems Engineering
Brookings, S.D.
www.sdstate.edu/abe

TENNESSEE
The University of Tennessee
Biosystems Engineering and Soil Science
Knoxville, Tenn.
bioengr.ag.utk.edu

TEXAS
Texas A&M University
Biological and Agricultural Engineering
College Station, Tex.
baen.tamu.edu

UTAH
Utah State University
Biological Engineering
Logan, Utah
be.usu.edu

VIRGINIA
Virginia Tech
Biological Systems Engineering
Blacksburg, Va.
www.bse.vt.edu

WISCONSIN
University of Wisconsin
Biosystems Engineering
Madison, Wis.
www.bse.wisc.edu

CANADA
MANITOBA
University of Manitoba
Biosystems Engineering
Winnipeg, Manitoba
umanitoba.ca/faculties/engineering/departments/biosystems

NOVA SCOTIA
Dalhousie University
Process Engineering and Applied Science
Halifax, Nova Scotia
www.dal.ca/faculty/engineering/peas.html

ONTARIO
University of Guelph
Biological Engineering
Guelph, Ontario
www.uoguelph.ca/engineering/undergrad-biological-engineering

QUEBEC
McGill University
Bioresource Engineering
www.mcgill.ca/bioeng/home

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