Welcome to the Winter 2016 issue of ABE@Illinois. Our department continues to have exciting and impactful stories to share and some of them are highlighted in this current magazine.

We are very delighted to let you know that Professor Vijay Singh was recognized as a 2015 University Scholar during a reception held on September 28th. This is one of the top honors for our faculty in the entire University of Illinois system. Only seven faculty members from the Urbana-Champaign campus were recognized this year.

Two articles in this month’s issue focus on the impressive achievements of other members of our faculty, as well as their students. Professor Alan Hansen has received numerous accolades throughout his career, but this year has been exceptional. Read more about Dr. Hansen’s research and teaching achievements on page 8. Professor Prasanta Kalita serves as Director of the ADM Institute for the Prevention of Postharvest Loss. This October, his team successfully organized and conducted the First International Congress on Postharvest Loss Prevention held in Rome, Italy. It was attended by more than 240 people from 62 countries. Key governmental and private organizations interested in this important global issue were represented at the Congress. We are especially pleased that four young ABE students were also able to attend the Congress. Read their story on page 6.

On September 21st, we lost former colleague and longtime friend and supporter, Professor Benjamin Jones. Ben was a member of our department for many years. After his retirement in 1992, he and his wife, Georgeann, continued to contribute to the advancement of our departmental programs in many significant ways. Many of our undergraduate and graduate students have received scholarships in their names. A good number of our teachers have been recognized by the outstanding teacher awards they established. We extend our condolences to Georgeann and the Jones family.

We hope you enjoy reading this issue of ABE@Illinois. Please contact us with any questions or comments. You are part of our great department, and we enjoy hearing from you!

Best regards,

K.C. Ting

Department Head
From farmer to student to pilot to professor, his life has had its highs and lows, “but it’s been thrilling,” said Donald Day, “and I’m very satisfied with it.”

Day was born in Oklahoma in the early years of the Great Depression and grew up on a 160 acre farm with three brothers. “A boyhood dream was to become an engineer,” said Day, “but we were of meager means, and I wasn’t sure how it would be possible.”

But dreams die hard, so Day followed his older brother Bob to Oklahoma A & M College where he worked part-time jobs during the school year and had summer jobs with the Soil Conservation Service and International Harvester. While in school, he joined the American Society of Agricultural Engineers (he was the recipient of the ASAE Student Honor Award in 1953) and served in various offices in the student branch. He also joined the Advanced Air Force Reserve Officers Training Corps and was commissioned as a 2nd lieutenant. Day received his bachelor’s degree in agricultural engineering in January of 1954.

That same month, Day married Dorotha Bamburg, a widow with a three-year-old daughter, Cheryl. Day adopted Cheryl, and the new family moved to Wisconsin, where Day worked for the Allis-Chalmers Company until he was called into active duty with the U.S. Air Force in April of 1954.

Day earned his pilot’s wings (another boyhood dream) and went on to receive pilot ratings for single and multi-engine, commercial, and instruments, and ground instructor ratings of meteorology and aircraft engines. Day was a co-pilot on the Convair B-36 Peacemaker bomber, at the time the biggest bomber ever built.

Day was honorably discharged after three years of active duty, and he took a teaching position at Texas Technological College in Lubbock, Texas. The family had grown to five by this time, with the addition of sons Keith and Dennis. Day knew if he wanted to continue a teaching career he would need an advanced degree, so he went on to earn a master’s in agricultural engineering from the University of Missouri and a Ph.D. from Oklahoma State University. Upon graduation, Day had job offers from North Dakota, Maryland and Illinois. He chose Illinois, and in 1962 he began a thirty-two year career in the Department of Agricultural Engineering.

Day was a highly respected ag engineer recognized nationally and internationally. He pioneered basic research in the areas of pollution control for livestock production and microbial conversion of wastes and by-products into feed and fuels. Day retired in 1993 but continued to work half-time teaching the livestock waste management course he developed and serving as faculty advisor for graduate students who were in process. Among other honors, Day was named an ASAE fellow in 1995.

While a faculty member in ABE, Day bought 21 acres seven miles east of Urbana, where he and Dorotha developed Aero-Place Residential Airport. He did the preliminary surveying for the residential subdivision and drew up floor plans for the house he still lives in today. Day held a pilot’s license for 60 years, and he often flew friends and colleagues to ASAE meetings around the country.

After 46 years of marriage, Dorotha died in February of 2000. The next year Day met Sarah Winger, and they were married in November of 2001. Day and Sarah are long-time members of Twin City Bible Church, where they have been active in missions. They have taken two humanitarian trips to Israel, to visit with and give teddy bears to children in hospitals who had been injured in the military conflicts there.

Day has had numerous health issues in the last decade, but he confronts them with faith and good humor. “By the grace of God,” he said, “I’m still here. I had my first heart surgery in 2005 and the damaged valve was replaced with a bovine valve – so now I’m part cow!”

*Juggling the demands of family and career and health has certainly presented challenges,” Day concluded, “but God-given aptitudes allow me to successfully cope with all of them.*
Greek life helps students down path to professional success

For most students living the Greek life on a college campus, the professional opportunities are just as important as the social opportunities. Most houses set high standards for grades, and involvement in the house can be a chance to learn leadership and organizational skills. Opportunities for professional development are plentiful, and connections to alumni often result in internships and job offers. Many ABE@Illinois students have chosen to pledge a fraternity or sorority, and almost all have chosen houses based on their future profession.

Brandon Marsh and Clint Pray are both juniors in TSM and members of IlliDell of Alpha Gamma Sigma. Brandon’s brother Tyler was a member of IlliDell, “so I knew what the house was about and what their goals were,” said Brandon, “and I knew that’s where I wanted to go.” Clint was first introduced to IlliDell when he heard another member speak at an FFA event at Kankakee Community College. “He and all the other members seemed very down to earth, and we had similar backgrounds and interests.”

IlliDell is a cooperative, so the house is completely member-maintained. “Everybody does a little so no one has to do a lot,” said Brandon. He has served in numerous offices, including house manager. This semester he is big brother chair, and he recently organized a trap shooting competition. “That was a very popular event,” he said. “We’ll be doing that again.”

Clint is the current house manager of IlliDell and, in addition to those responsibilities, he has always been active in the house’s philanthropy events. “We host the Bags for Ags tournament with Sigma Alpha [a professional agriculture sorority] every year, and the proceeds go to the Champaign County Farm Bureau. We also donate money to the Champaign Police Lodge for their charities.”

Brandon said his time at IlliDell has helped him learn valuable leadership skills. “It’s better to be a leader than a boss,” he said. “People don’t like to be told what to do, so if you say, ‘Let’s go do that,’ instead of ‘You go do that,’ people will respect you.”

Brandon Marsh, left, and Clint Pray relaxing at IlliDell
Ben Kovalick and Pete Vandermyde are seniors in ABE and have been members of Alpha Gamma Rho, an agricultural fraternity, since their freshman year. They were roommates for much of that time, both served two years on their executive board, and both have held a number of different offices.

“This semester I’m the vice president of membership development,” said Ben, “so I’m a mentor for the new members. I try to get to know them, make sure they’re adjusting to the university and keeping up on their grades. It’s a big commitment, but very rewarding.”

Pete served as the professional development chair, helping other members develop a resume and prepare for interviews at the annual Career Fair. “We have a number of alumni who recruit at the fair, so if they know you’re in AGR, they automatically know you have a strong ag background. We have about 2,000 alumni through our chapter alone,” he said. “With such an extensive network, there’s always someone who can help you, no matter where you go in your career.”

Alex Maher is a senior in TSM. He joined Farmhouse his sophomore year, after living in the dorms as a freshman. “I met some guys from Farmhouse my senior year of high school, and when I came to the University, there were several in some of my classes. Talking with and getting to know them made me realize Farmhouse was the best fit for me.” Alex worked as the house commissar for a year and said being in charge of the kitchen, helping organize menus and buying supplies was a great learning experience. “I think being in a house like this definitely gives you an advantage in the workplace. My boss two summers ago was an alum, and it gave us something to talk about. I think those common experiences help you get your foot in the door when you’re looking for a job.”

Karina Barrios is a junior in ABE and a member of Alpha Omega Epsilon, a social and professional sorority for women in engineering. “It was hard to make friends those first weeks on campus,” said Karina, “so to find a group of women who have the same mindset – school is important and classes are going to be hard – was really helpful. We have professional events where a representative from a company will come and speak, or we’ll join with the Society of Women Engineers for an event,” she continued, “but we also have social events with other fraternities on campus, and philanthropic activities as well.” Karina is the philanthropy chair this semester, and she organized a cookie fundraiser with the proceeds going to Illini Service Dogs.
Brittany and Delayne Durdle

On her first day at the University of Illinois, Brittany Shoemaker walked out of Foellinger Hall on her way to her next class and called Delayne Durdle. “It was a little like fall that day, the quad was gorgeous, and we talked about how excited we were to be at Illinois,” said Brittany. She married Delayne five years later, but that probably wasn’t something either of them were thinking about that day.

Brittany and Delayne met in the spring of 2009, “at one of those awkward high school prom dinners,” said Brittany, “where the couple at one end of the table had nothing in common, the couple at the other end had broken up the week prior, and everyone spent too long staring at the menus trying to think of a conversation starter.”

“We had taken different dates, but by the end of the night we had hit it off,” said Delayne. They began dating later that summer and realized they had both accepted offers to Illinois. In 2013, both graduated with a degree in Technical Systems Management and a minor in Agricultural Safety and Health.

“We enjoyed being in the same department,” said Delayne. “We would challenge each other to excel and compare grades and have a friendly competition. I specifically remember testing a project I was working on for ABE 100. We were tasked with setting up a boat to examine the soil and water conservation pond. We had outfitted the boat with a trolling motor, oars, and other equipment to check the depth of the pond. I got to take Brittany out on the boat’s maiden voyage to make sure everything worked correctly.”
“We took some classes together, and I enjoyed that,” said Brittany, “but I really loved discussing the agricultural industry’s current events and challenges with Delayne. I found it helpful and fun to be in the same department.”

Both had practical advice for students just beginning their academic career. “Take more technical TSM courses,” said Brittany. “Hands-on experience is always valuable.”

“And get industry experience in the field that you’re interested in – it’s invaluable when you’re starting a career,” said Delayne.

Delayne and Brittany married in June of 2014, and they now live in rural Streator, Illinois. Delayne works at Dow AgroSciences as a Quality and Scheduling Coordinator at the Pontiac, Illinois parent seed site. Brittany also works at Dow as a Quality and Scheduling Coordinator at the Grand Ridge, Illinois hybrid seed corn site. She is currently working on her MBA in supply chain management.

The Durdles recently purchased a new home, and they spend time on home improvement projects, gardening and landscaping. They help on the family farm, and even go hunting and fishing together.

“We went to Illinois as a couple and graduated four years later, engaged to be married,” Brittany concluded. “We enjoyed all of our time at Illinois. We’ll always be an Illini family.”

Kim and Randy Noe

Many ABE students will tell you their involvement in Illini Pullers was the most valuable experience of their college career. It teaches leadership skills and provides hands-on experience that is difficult to obtain any other way. Kim Heinecke and Randy Noe would probably agree, but they came away with significantly more.

Randy transferred to the University of Illinois as a junior in the fall of 2009, and their first encounter was at the Illini Puller’s Welcome Meeting. They didn’t formally meet until the next day, Kim said, in their ECE class. “I nudged one of the other Pullers that I was sitting with and said, ‘Is that the scrawny kid from last night?’ He said yes, so I invited him to sit with us.”

“Having the same major and being involved in the same student organization meant we spent a fair amount of time together,” said Randy, “even before we started dating the following spring. Our friends all claimed to have seen it coming before either of us did.”

“It wasn’t difficult for us to be in the same department,” said Kim, “but we were and still are very strong-headed persons, so being on the same team was sometimes difficult when it came to making decisions and working together for hours on end.”

Kim and Randy both graduated in 2012 with a degree in agricultural and biological engineering and a specialization in off-road equipment engineering.

Kim works as an energy senior engineer for John Deere. “I program manage the global effort to determine low or no cost options to improve energy, and I share best practices for energy efficiency in the states regarding paint and general practices,” she said. “I enable sites to receive utility based rebates for energy efficiency projects and review electricity and natural gas supply contracts.”

All that sounds very technical, but “I enjoy the ‘people’ aspect of my job the most,” said Kim. “I meet people from across the U.S. and the globe, and I get to learn about their lives.”

Randy works as a validation engineer at Caterpillar’s Peoria Proving Grounds. “I plan and execute tests for machine and sub-system performance on motor graders, and I’m responsible for data analysis and documentation of results for the majority of the test work that I do. I also perform functional checkouts, high hour teardown inspections, and document issues found on prototype machines.” Randy enjoys the variety in his work, saying, “No two tests are ever the same.”

Kim enjoys cooking and baking. Randy spends time helping his parents on their farm after work and on weekends, and they help Kim’s parents on the farm whenever they can. Randy is involved with the Knox County Farm Bureau Young Leaders and Kim is an ABET program evaluator; she will go on her first visit this fall as an observer.

Randy said he enjoyed being in the same department with his future wife. “It allowed us to spend time together – otherwise we may never have met.”
“There is no app for optimizing postharvest loss prevention.” That’s a memorable quote from a memorable conference, and one quite appropriate for a new generation just learning the facts about postharvest loss (PHL).

This October, four students in the Department of Agricultural and Biological Engineering (ABE) were given the opportunity to participate in the First International Congress on Postharvest Loss Prevention held in Rome, Italy. Alex Brockamp, Kara Brockamp, Matthew Niewiara, and Chelsea Peterson learned in early September that they had been chosen to attend the congress, which was sponsored in part by the Archer Daniels Midland (ADM) Institute for Postharvest Loss Prevention at the University of Illinois.

Sophomore Matt Niewiara said he heard the statement above in a presentation by C.D. Glin, associate director in The Rockefeller Foundation’s East Africa office. “I thought it was a great way to explain that PHL prevention is a very dynamic problem with many possible solutions,” said Niewiara, “some of which might not have even been thought of yet.”

Glin was only one of an impressive list of speakers that included luminaries from the Food and Agriculture Organization, the World Food Programme, the Bill and Melinda Gates Foundation, Deere and Company, and the USDA. Speakers from Illinois included Prasanta Kalita, director of the ADM Institute and a professor of agricultural and biological engineering; President Emeritus Robert Easter; Pradeep Khanna, associate chancellor for corporate and international relations; and Robert Hauser, dean of the College of Agricultural, Consumer and Environmental Sciences (ACES).

Although the students’ experiences at the congress varied according to their interests, some common themes emerged in their discussions.

The enormity of the problem

“Before the congress, I knew food waste was a problem,” said Niewiara, “but I didn’t realize how significant various estimates for global PHL were. Hearing that roughly a third of food is lost made me realize how large this problem truly is.”

Alex Brockamp, a freshman, said, “I didn’t know much about PHL coming into this, so I was completely taken aback by the amount of loss around the world. When I thought about PHL, I imagined grain spilling out of the top of a wagon. It is safe to say my idea of PHL has changed dramatically.”

The solutions might seem simple, but implementation is the real challenge

Willis Owino, a speaker from Kenya, showed a video of tomato transportation after harvest. Workers threw tomatoes on top of tomatoes into crates in the fields, sometimes missing the crates or bruising the tomatoes underneath. The students said it was a striking video that helped them visualize things happening in developing countries that contribute to the problem. “On the face of it, putting tomatoes in crates doesn’t seem like a challenging task,” said Brockamp, “but the logistics of implementing the simple solution is the hard part.”

Kara Brockamp, Alex’s twin sister and also a freshman, said, “There are so many different aspects to PHL prevention and so many different situations that it’s going to take the efforts of thousands of people working toward a common goal to noticeably impact postharvest loss. Ertharin Cousin from the World Food Programme said, ‘We fail those who need us by trying a one-size-fits-all approach.’ Something that may be the perfect solution in one situation may be a total flop in another.”

PHL in developing countries is different than PHL in America

Kara said the congress “opened her eyes” to the problems they face in developing countries. “In America, we have the luxury of storing grain in bins, but some developing countries don’t even have bags to store grain, and so the grain is contaminated. From our standpoint, a bag seems like such an easy fix, but when the producers in other...
countries are taking care of their families on under a dollar a day, a bag is not an affordable investment.”

Chelsea Peterson, a freshman, is interested in restoring and conserving natural resources. “Coming from an environmental perspective, I was trying to determine how we can convince farmers and those struggling with food security to consider the long term impacts on the environment,” she said. “Mary Wolfe, the president of ASABE, answered my question. She told me the farmers need food first. Then they can start considering the environment.” Upon learning that women are the primary producers in many developing countries, Peterson said, “I wasn’t expecting the issue of gender to be as prevalent as it is. Now I understand that the needs of women and their families have to be considered when implementing PHL solutions.”

Having students participate in the congress was Prasanta Kalita’s brainchild. “The purpose of the congress was to bring all the ‘experts’ who really care about postharvest loss reduction to the same table, and that was a tremendous success,” he said, “but I’m all about the students. I was thrilled that we could include them, and I think it was an amazing learning opportunity for them.”

Financial support from the Campus Honors Program, the College of ACES, the Department of ABE, and the ADM Institute covered 100% of the students’ expenses.

A trip to Rome was an opportunity none of the students anticipated when they came to school this fall. They took advantage of the time to see the sites – a guided tour of the Vatican and the Coliseum were big hits with everyone. But when asked to express what impacted them most, their answers were very similar. Alex Brockamp expressed it best.

“It was amazing to see the dedication of the people involved with PHL,” he said. “They’ve given their lives to help reduce food loss. It’s an admirable commitment, and I hope someday I can be as dedicated to something as they are to postharvest loss.”
Dr. Alan Hansen, professor and section leader of the Off-Road Equipment Engineering division in ABE, has had a very good year.

On April 11, Hansen received the Paul A. Funk Recognition Award from the College of Agricultural, Consumer, and Environmental Sciences. This is the college’s most prestigious award, given each year to recognize outstanding achievements and exceptional service to the college. In part, the college stated that Hansen’s “cross-cultural considerations and opportunities in the education of future engineers have become a distinctive focus of his work, with excellence spanning teaching, research, and public engagement in the best tradition of the land-grant university.”

On July 27, Hansen was inducted into the American Society of Agricultural and Biological Engineers as an ASABE Fellow at the 2015 ASABE Annual International Meeting held in New Orleans. Hansen was “honored for his outstanding national and international contributions to education and research in agricultural and biological engineering.”

In September Hansen received word that Illinois had been chosen as the lead institution of the Appropriate Scale Mechanization Consortium (ASMC) for the Feed the Future Sustainable Intensification Innovation Lab. Hansen is the project lead for the 4-year, $4.7 million project funded by U.S. Agency for International Development. The project will help develop tools, technologies, and methods that best suit smallholder farmers in Bangladesh, Cambodia, Ethiopia, and Burkina Faso.

And finally, on November 15, Hansen was the recipient of the USDA’s regional Food and Agriculture Sciences Excellence in Teaching award. He was honored based on his ability as a classroom teacher, his use of innovative teaching methodology, his service to students and their profession, and his scholarship.

Although this year stands out, Hansen has been recognized for his professional accomplishments many times since he joined the department in 1999. As a principal or co-principal investigator he has received more than $12 million dollars in funding, which includes the ASMC grant as well as his collaboration with the Department of Mechanical Science and Engineering at Illinois. They obtained competitive funding from the U.S. Department of Energy to establish the Graduate Automotive Technology Education Center of Excellence.

Last year, Hansen was awarded the Undergraduate Teaching Award, given by the Office of the Provost and Vice Chancellor for Academic Affairs, and students have voted him excellent some 39 times in the last 16 years. He is also known for conceiving a widely acclaimed program that teams Illinois students with peers at the University of KwaZulu-Natal in South Africa. It has become a model for faculty-led, project-based study abroad programs.

Hansen is also a full member of the Club of Bologna, a world task force devoted to the development of agricultural mechanization. The club includes the most prominent international experts on mechanization, who address the development of the agricultural machinery sector in various countries. There are 49 countries represented with 122 members, and Hansen is one of only five U.S. academics in the club.

Congratulations, Dr. Hansen - you are an excellent representative of our department and the University, and we applaud your success!
by many for excellence in teaching
TSM 233
A popular class that offers practical experience

Students with little or no experience in welding work in a shop environment to build their skills on many different welders. Learning how to troubleshoot issues and work safely make this course one students will use in both their personal and professional lives.
“In this class, you get out what you put in,” said Dan Kunz, a senior majoring in Technical Systems Management (TSM). He’s talking about TSM 233: Metallurgy and Welding Processes, one of the most popular courses the department offers. Although TSM 233 is not mandatory, it is one of the many elective courses offered to fulfill the TSM degree requirement, and one many students choose to take.

Part of the reason for that is the practical, hands-on aspect of the course, which most students enjoy. “Coming into the course I had some minor experience welding with a MIG machine, but I was definitely an amateur,” said Kunz. “I was able to increase my skills on many different welders and at the end, I was able to build my own final project. I really enjoyed working in a shop environment where I was constantly learning how to trouble shoot issues and work safely.”

Kunz enjoys restoring motorcycles and working on cars, and he sees himself using his welding skills for the rest of his life. “I was even able to put my skills to use during my summer internship,” he said, “when we had equipment failures and no mechanic on the job site.”

Alex Maher, another senior in TSM, said, “I knew welding would be a very good skill to have and I wanted to get more experience with it. There were certain aspects of the class that were a little difficult, like TIG welding. That’s just another type of welder that can be very tricky to work with if you aren’t experienced. I had some knowledge and experience going into the class, but not much, so I definitely learned a lot.”

Vassilios Lygiros said he saw TSM 233 as “an opportunity to learn and improve on a skill that many companies are searching for, but few graduating seniors possess.” The hands-on aspect of the course was a primary motivator for Lygiros, and he thoroughly enjoyed it, although he also said there were difficult moments throughout the course. “Many of the welding techniques are challenging for a novice such as myself to learn and master. But that only made successful project completion more meaningful and impactful.”

Another reason for the popularity of the class is Joe Harper, the course instructor. “Dr. Harper is an awesome professor,” said Kunz. “He really knows his stuff.”

“Dr. Harper is a great teacher,” Maher agreed. “I really enjoy having him as a professor – I’ve taken all his classes.”

“He keeps the class interesting by using a healthy amount of anecdotes and ‘Harperisms,’” said Lygiros. “It gives a personal touch to otherwise standard lecture notes.”

This semester Kunz and Lygiros are helping Harper with the class. Some of their responsibilities include attending class labs twice a week, holding open labs, and maintaining lab equipment. “We also try to ensure that students have a safe environment to work with these powerful machines,” said Kunz.

Minor accidents still happen, and most students will tell you they’ve been burned more than they like to admit. “I once saw a student dunking his work boot into one of the cooling buckets because some slag landed on it,” said Lygiros. “We had a good laugh about it once he cooled his shoe.”

And of course, both students acknowledge there is a world of difference between taking a course and teaching it.

“It’s so difficult to learn all the information Dr. Harper makes available to you in only one semester,” said Kunz. “Having the opportunity to walk through the course again, I’ve gained a better understanding of the material. Things become much clearer to you when you have to explain it to a student. I remember a lot of minor things always confused me, so I’ve tried to take the time to explain those things to students in a way I wish someone had with me.”

Lygiros agreed, adding, “In our position, we must be able to explain and teach one student one way, and then change our teaching technique for another student to better understand the concepts being taught. Being a ‘teacher’ has made me more open-minded about the way people learn and understand material. It requires a lot of time, patience, and understanding.”

“Assisting Dr. Harper with this course is more an honor than a job,” Kunz concluded. “I’m happy that I can give back to my favorite course yet.”
Irfan Ahmad holds a chip-based nitrate sensor initially developed at ABE with USDA collaboration. It is being adapted for broad environmental applications integrating hand-held technology.

Irfan Ahmad – working at the intersection of commitment and compassion

Irfan Ahmad is the executive director of the Center for Nanoscale Science and Technology (CNST), established by the College of Engineering in partnership with the Office of the Provost. Ahmad was hired at CNST in 2002 as an assistant director, to work, he said, “at the intersection of engineering and agriculture, and to address the overarching agricultural biological problems that could potentially find engineering solutions. In this case, the focus was on nanotechnology.”

Ahmad is an agricultural engineer and an alumnus of the Department of ABE, having earned both his master's and his Ph.D. under the guidance of former faculty members John Reid and Marvin Paulsen. His postdoctoral work in sensing was also carried out at ABE, under the supervision of John Reid, and later John Hummel from the USDA. He currently serves as an affiliate faculty member in the department, and is also a resident research faculty at the Micro and Nanotechnology Laboratory.
Ahmad says he is a researcher at heart, and his position at CNST is an opportunity to work with scientists and students across a variety of disciplines. Some examples of his recent projects with multidisciplinary team members include:

- “I am a big proponent of environmental sustainability. Toward that end, we are developing biosensors to enable environment-friendly agriculture. Currently, farmers are hard pressed to know accurately the nutrient needs for their fields. To know or recognize how much fertilizer to apply poses a challenge, so they generally over-apply. Can we develop a nitrate sensor—a hand-held device—that would not only sense nitrates in the soil but also other micronutrients? It is critical that ag engineers work with soil scientists and agronomists to develop those sensors.”

- “I am working right now with a plant pathologist and a mechanical engineer to study plant disease using nanoelectromechanical systems (NEMS), particularly for corn, soybeans, and wheat and provide plant breeders with insight into the genetic behavior of the disease. This will enable them to engineer varieties that are resistant to a particular plant fungus.”

- “Colleagues and I have had a project with the USAID on nanomedicine for cancer research. We looked at the chemical analysis of 50 plant extracts from a database of 3000, provided by collaborating scientists at the University of Karachi, Pakistan. We studied the interaction of these plant extracts with breast cancer and pancreatic cancer cells. We used biophotonic crystal sensors developed by a colleague, Brian Cunningham here at the Micro and Nanotechnology Laboratory, and we observed that some of these plant extracts actually kill the cancer cells, while others made them proliferate. These extracts can also be used for killing infectious diseases such as malaria, TB, etc. So there you have an example; the nexus of agriculture, medicine and engineering is contributing to address a larger problem like cancer.”

Nanotechnology is a relatively new area, and Ahmad also leads the effort to train the next generation workforce. “The BioNanotechnology Summer Institute is an ongoing program that we have conducted annually for the last six to seven years,” he said. “For these summer institutes, we receive approximately 125 applications from around the world. We select 48 to 50 applicants to participate in hands-on training. This is work that is carried across multiple disciplines, so these students come not only from a number of engineering fields but also from basic sciences fields, like physics, chemistry, biology, or mathematics. They are here for two weeks and spend time in labs doing hands-on work. They also attend lectures and engage in networking sessions.”

A second program Ahmad and the CNST-affiliated faculty initiated two years ago, funded by the NSF, is the nano@illinois RET, or Research Experience for Undergraduates. “We train and mentor undergraduate students in cutting-edge research in nanotechnology,” said Ahmad. “Students are attached to individual faculty for six weeks during the summer and exposed to different areas of nanotechnology, whether it’s photonics or electronics or sensing or computational.”

Ahmad said it is imperative to ensure we have an unimpeded STEM (Science, Technology, Engineering and Mathematics) pipeline by exposing STEM teachers and community college faculty across the nation to innovative research in nanotechnology. Another program, nano@illinois RET, or Research Experience for Teachers, offers teacher-focused lectures, ethics seminars, hands-on modules, STEM education issues, career choices, and resources for implementing a nano lab and curriculum. “We have had two cohorts so far. Now these teachers have information they can take back to their classrooms and incorporate into their curriculum. We believe that is the best way to ensure a positive outcome for students coming to college.”

Another popular outreach is nano@illinois at the Public Square. Graduate students work with area children at a booth set up at the Urbana Farmers’ Market.

Moved by the healthcare disparities in the community, Ahmad made a significant commitment to his community. In 2009, he led the efforts to establish the Avicenna Community Health Center, a free clinic for under- and uninsured people in Champaign County. The center has taken a systems approach to healthcare delivery, and is primarily run on philanthropic donations, providing integrated high-quality, preventive and curative healthcare on Sunday afternoons from 1:00 to 4:00 p.m. Ahmad says it takes 20 to 25 hours during the week on the part of the management team and volunteers to undertake behind-the-scenes work necessary to run the clinic. Local physicians and specialists volunteer their time, and volunteers use their skills each week in medicine, community health, engineering, business, law, computer science and other areas to make sure the clinic runs smoothly.

“At Avicenna, we have provided services to about 2,500 people now,” said Ahmad, “and it’s a very moving experience. Compassion is the glue which holds a society together, especially when you’re talking about the people in your neighborhood. If your neighbor is hungry or unhealthy, you do what you can. Our student volunteers are our inspiration. Most of our volunteers are Illinois students (including several from ABE), faculty, or alumni. It’s an excellent platform for them to give back to their community, while learning about the issues confronting our society. All of this has a positive impact on them, as they move into next stage of their academic and professional lives. Engineers don’t have to be confined to their work only. They can take a broader societal view, which can be characterized as socially responsible engineering.”

For more information on Avicenna, visit www.avicennahealth.org

For more information on nanotechnology at Illinois, visit www.cnst.illinois.edu
Brehanna “Bre” Jordan  
Class of ’15

Brehanna earned her undergraduate degree in TSM at Illinois. She chose the PSM option because "I could get the best of both worlds. A business and science degree is the best combination. Having both backgrounds will take me far in my career."

Bre interned with Acceptance Solutions Group, a small loan company in Chicago. She served as an IT assistant intern; some of her responsibilities included setting up workstations for new employees, troubleshooting network problems, downloading program systems, and marketing the company in business meetings with different lenders. "I also saw the entrepreneur side of the business," said Bre. "One person put together a little business that grew from 15 employees to 70 employees in two months. It was an amazing experience to be part of.

"Anyone considering this degree should go for it!" she concluded. "It’s only 16 months, there’s no thesis, and the support system is phenomenal. It can’t get any better than that."

Saloni Mishra  
Class of ’15

Saloni earned dual undergraduate degrees in political science and informatics at Illinois. "The PSM in TSM was a fitting option for me because I was looking for a program that not only taught the technical aspect but integrated it into business courses and created a well-rounded experience for the students."

Saloni interned as a business analyst at Country Financial in Bloomington. She credits the Illinois PSM for helping her develop the communication skills needed for various departmental presentations and meetings. "I was exposed to managing a small team of people on a case study to achieve a marketing goal, and I learned how to work with people of different personalities."

"I eventually want to be an executive in the corporate world, and this program does an excellent job of preparing students to hit the ground running."
Tarik Negreiros
Class of ’15

Tarik earned an undergraduate degree in agricultural engineering at the University of Campinas in São Paulo, Brazil. “I chose Illinois because of the ranking of the department and the amount of resources provided to students. The flexibility of the PSM program allowed me to choose the courses I felt were most useful to my professional development.”

Tarik interned with Caterpillar as a design engineer. “I was part of an engineering team that designed and improved parts for construction machines. I also performed structural analysis and developed new tools and devices to address specific requests from customers. It was a great opportunity to develop a solid network with highly experienced colleagues and expand my knowledge on machine design.”

Tarik said it was also possible to show the value of the PSM program to the company. “I believe this degree differentiates me from the majority of engineers. It allows me to easily communicate both engineering and science subjects in a business language to managers and directors, saving time and money.”

Christopher Godwin
Class of ’12

Chris was a member of the inaugural TSM cohort of Illinois PSM students. He earned an undergraduate degree in TSM at Illinois, and chose TSM for its engineering aspects and its roots in problem solving. “I knew the program well and already had a background in it, so I was looking forward to building upon the foundation I already had set.”

Today Chris works as a technical consultant for Infor, a software company that specializes in enterprise solutions for customer relationship management, supply chain management, enterprise management, and more. “My degree gave me an edge on the competition,” said Chris, “because potential employers knew they were getting a versatile employee. I used my experiences in the classroom and in my internship to show employers I could learn a new job fast and solve any problems that came up. That’s been useful in my current position, as I spend a lot of time coding in a language I had to learn quickly when I started here two years ago.”

Chris’s advice to PSM students? “Take challenges head on. Whether you succeed or fail, employers will look favorably on the fact that you were willing to try, and they’ll be able to count on you to step up to the new challenges that come daily in the workplace.”
Illinois/IDOT collaboration could save the state significant dollars
If you travel north on Interstate 57 from Champaign to Rantoul, you’ll see a test plot of native grasses - switchgrass, big bluestem, prairie cordgrass and Indian grass. It’s very possible you could see those same grasses growing on many Illinois highways in the near future.

In 2012, the Illinois Department of Transportation (IDOT) asked the University of Illinois to investigate the feasibility of planting fast-growing perennial grasses as an energy crop on state highway rights-of-way. The state maintains more than 100,000 acres of non-paved public land. Mowing directly adjacent to the roadway is necessary for traffic visibility and safety, but the remaining right-of-way could represent a new opportunity – developing a renewable energy source that could save the state significant dollars. The sale of this biomass could pay the cost of highway mowing, provide fuel for IDOT vehicles, and increase the sustainability of electricity generation.

Luis Rodriguez is an associate professor in ABE with a research focus in modeling and analytics of complex food and agricultural systems. As a member of the Illinois/IDOT project team, Rodriguez said he spent a considerable amount of time looking at DeWitt County. “It was a good example of a fairly rural Illinois county with a reasonable amount of highway going through it,” said Rodriguez. “The people working there explained to us how they would conduct such an operation, so our cost numbers are derived from that analysis.

“As you can see from the pie chart, we distributed the cost across the entire supply chain,” he continued, “and our analysis showed it would cost approximately $22/mega gram or metric ton of biomass. I think that’s probably an optimistic number, but it’s possible, and it’s a very small number relative to some of the numbers we found in our related analyses for farm-based biomass production.”

Rodriguez said the primary reason for the disparity in cost is that the highway acres are already owned by the state and not under corn and beans, so the opportunity cost for that land is relatively low. “If anything,” he said, “those lands cost the state money. Can you use that same cost and produce something of value? I think so. Twenty-two dollars is probably a break-even number for the state relative to what their current costs are, or close to it, but at least they would be producing a product that may have value in other places.”

Some potential markets for the biomass include the use of bales to heat and power IDOT depots around the state, and the grass pellets could be burned in home stoves. They could also be used in conjunction with wood pellets in power plants. It’s been determined that emissions from a 50/50 combination of grass and wood pellets are similar to the emissions from wood pellets only, the efficiencies are also similar, and there are no real operational problems.

The three-year project is now complete, but Rodriguez said there is a possibility for future funding to continue the study. If that happens, Rodriguez will be tasked with analyzing the machine sets available to harvest biomass in counties across the state and how best to utilize them.

“Even if you harvest all the biomass in a county, the number of machine hours to do that is relatively low,” he said. “So that suggests that a machine set might be oversized for an individual county. If so, how many counties can you really handle with a small machine set? Our job would be to help the state make a better prediction on exactly what machinery they would need relative to what they currently have, and how to size a region or district that would be handled by a unique set of machines. That would depend on the roadway networks, the amount of available biomass in each of those roadways within a county, and the availability of labor and machinery.”

Other members of the project team included Hans Blaschek, project lead and professor emeritus in Food Science and Human Nutrition, Alan Parrish (agronomy), D.K. Lee, associate professor in Crop Sciences, Gary Letterly, an Extension educator in Energy and Environmental Stewardship, Todd Rusk, a senior energy specialist in the Department of Urban/Regional Planning in the College of Fine and Applied Arts, John Scott, a senior chemist at the Illinois Sustainable Technology Center (ISTC) and B.K. Sharma, a senior research engineer with ISTC. Steve Massey, IDOT sustainability practices manager, was the IDOT contact for the team.

<table>
<thead>
<tr>
<th>Activities</th>
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<tr>
<td>Harvesting</td>
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<tr>
<td>Packing</td>
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<td>In-field transportation</td>
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Cost analysis of IDOT project in DeWitt County
Microcontrollers and assorted components used to build automation systems like temperature controllers.

We want your feedback about ABE@Illinois. Please send your comments to Leanne Lucas at llucas@illinois.edu.