



ABE @ Illinois

Agricultural & Biological Engineering

Spring 2010



ABE Graduate Program Ranked #1 in Nation!

Celebrate ABE@Illinois September 17-18

Inside:

- International Influence Marks Distinguished Career for Art Muehling
- U of I Ties with Berkeley for *Best Software Tool* at 2009 iGEM Competition
- ABE Graduate Program Ranks #1 in Nation
- Department of Agricultural and Biological Engineering Shines at *ExplorACES* and *Engineering Open House*
- ABE 100 Competition Caps Successful Semester



ABE@Illinois
Spring 2010

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Greetings from Agricultural and Biological Engineering

As a faculty member, department head, and alumnus of ABE@Illinois, I enjoy the opportunities to greet our alumni and friends in many different ways. I always look forward to greeting all of you when we present a new *ABE@Illinois* magazine to a very large audience. Many new things are happening on our campus, and our department has been preparing to respond to forthcoming changes.

Our campus leaders, by engaging faculty, staff, and students, have been moving forward with the *Stewarding Excellence @ Illinois* initiative, a campus-wide program that hopes to address the fiscal challenges our institution currently faces. The underlying processes are institutional transformation, cost reduction, and revenue generation. The outcomes of these history-making processes are expected to define the future of the University of Illinois at Urbana-Champaign. A number of project teams have been (and will continue to be) assembled to review academic units, research centers, business functions, etc. and make recommendations for possible actions. I invite you to visit <http://oc.illinois.edu/budget/index.html> for details and updates of this initiative.

Two key features for strengthening our position to benefit our department from the changes are sustainability and competitiveness of our programs. We have been making continuous efforts in identifying what we are best at, defining what makes a great department, improving our efficiency, and increasing the values of deliverables to our constituents. We have had many discussions on how to optimally deploy our resources to advance our departmental goals. Recent examples are the ABE Teaching Resources Retreat (conducted in January this year) and the creation of the ABE Futures Council as an extended network to the ABE Futures Committee. We are always interested in ideas for continuously making our programs relevant, significant, successful, and impactful. Your suggestions and comments are most welcomed.

K.C. Ting
Professor and Department Head
ABE@Illinois



**K.C. Ting,
Professor and Head**

ABE Graduate Program Ranks #1 in Nation

-- LeAnn Ormsby

U.S. News & World Report recently announced its 2010 ranking of the best engineering schools in the United States. This year, the top-ranked graduate program in agricultural and biological engineering was awarded to the Department of Agricultural and Biological Engineering (ABE) at the University of Illinois at Urbana-Champaign. The University of Illinois program received the highest ranking tied with Purdue University, followed by Texas A&M University, Cornell University, and University of California--Davis to fill the top five spots. The department's undergraduate program also ranks best in the nation and has held this honor for four consecutive years.

"We have an excellent graduate program and appreciate the recognition for being among the best," said K.C. Ting, head of the U of I Department of Agricultural and Biological Engineering. "We have set our goal to continue to stay sustainable and competitive by keeping our program relevant, impactful, significant, and exciting."

Ting gives much of the credit for the rankings to outstanding faculty, staff, and students. "We have very high-quality people," Ting said. "We know what we need to do to keep our program going well, and we're doing those things. We don't think of it as staying ahead. We just want to stay great."

International Influence Marks Distinguished Career for Art Muehling

Although Art Muehling has retired in Champaign, Illinois, his long and distinguished career often took him far from the family farm where he grew up near Cissna Park, Illinois. Muehling received a bachelor's degree in Agricultural Engineering from the University of Illinois in 1950, and a master's in Agricultural Engineering from the University of Missouri in 1951.

"But I came through that unusual period where you either went to school or you were drafted," Muehling said. "So I spent four years in the Air Force after I got my graduate degree. I studied meteorology at the Graduate Engineering School of New York University the first year, and spent the next three years doing weather forecasting in Louisiana, then French Morocco, then Colorado Springs."

Muehling said it was quite an experience for a young man from the small town of Cissna Park to move, first to a large university like Illinois, then on to New York and from there to French Morocco. Shortly after his discharge from the Air Force, Muehling began his 36-year stint at the University of Illinois.

"While I was finishing my last tour of duty in Colorado Springs, I received a letter from Professor Carter, head of the Farm Structures Division, telling me they had a research project I might be interested in, and would I like to go to work?" Muehling recalls. "I was discharged and left Colorado Springs on January 20, 1956, and started here on January 23, three days later."

Muehling began his career as a research associate in Agricultural Engineering, conducting research in swine housing systems and swine environment. "I worked with Al Jansen from Animal Sciences, and we bought little pigs - three weeks of age - and we raised them at different temperatures, trying to determine the best way to shelter them in cold weather."

In 1961, Muehling accepted an Extension position as a specialist in farm buildings. In that position, Muehling was considered one of the earliest proponents of confinement housing and slotted floors for pigs.

"About 80 percent of my work was confinement pig housing, and we really started the slotted floors here at Illinois," said Muehling.



Art Muehling and wife, Mary, on a cruise down the Li River of Southern China last August

"Waste management was also a big area, and I was a member of the group that helped write the regulations for the EPA."

During his Extension work, Muehling was part of a four-member Swine Seminar Team who generally conducted 25 to 30 swine seminars throughout the state every year. Also, many Extension advisors arranged farm visits which were made helping farmers plan new facilities or remodel existing facilities.

Muehling's substantial contributions to the area of livestock waste management included serving as an advisor to the Illinois EPA, working as chairman to plan the ASAE International Symposiums on Livestock Waste, organizing eight Illinois Livestock Waste Management Conferences, and serving on the Advisory Committee of the National Pork Industry Handbook.

Muehling also had extensive involvement in international activities, beginning with a 1966 Midwest Livestock Producers Tour of Europe. He later spent three sabbaticals doing research and studying swine housing and livestock waste management around the world.

His first sabbatical found him at the Max-Planck-Institute in Bad Kreuzhach, West Germany in 1969. He said the time with his family in a country with a markedly different political climate was memorable.

"Early in our sabbatical, we made a two-week trip into Hungary and Czechoslovakia, so we drove across the communist border," said Muehling. "They had to check our visas, the whole thing, so it was a little exciting."

continued on page 15

Front cover, from left: Patricia Paulasky (freshman in ABE), Dr. Angela Green (assistant professor in ABE), and Loren Anliker (sophomore in ABE) place chickens into the preference chamber. See "Research Opportunities Abound for Undergraduate Students," pg. 12.

Inside:

ABE 100 Competition Caps Successful Semester	6
ABE Futures Committee Expands to Include ABE Futures Council.....	14
ABE Graduate Program Ranks #1 in Nation.....	2
Alumni Spotlight	
Dan Roley	4
Jennifer Wolf	5
Club Update	
2009 iGEM Competition	9
Department of Agricultural and Biological Engineering Shines at <i>ExplorACES</i> and <i>Engineering Open House</i>	10
Profile Emeritus	
Art Muehling	3
Research Opportunities Abound for Undergraduate Students	12

Roley Heads Standards and Regulations at Caterpillar

Dan Roley, MS '72 AgE, has been with Caterpillar for his entire engineering career. Roley received both a bachelor's and a master's in Agricultural Engineering from the University of Illinois. He went on to earn a Ph.D. at the University of California - Davis before taking his first of several positions with the world's foremost manufacturer of heavy equipment.

"My Ph.D. was in ergonomics and vibrations, so I started out at Cat working in those areas as a research engineer," said Roley. "I went from research to machine testing and evaluation for a few years at our proving grounds."

In 1981, Roley and his young family spent a year in Nancy, France. "I was part of a US-France 'exchange of scientists' program. The program was sponsored by the National Science Foundation, and I spent a year doing research in human exposure to vibration."

Upon his return, Roley worked as a project engineer for the testing and evaluation of Caterpillar's rubber tracked ag tractor. "I worked at that for about four years, and then I moved to our technical center in the power train development area for a few years. After that, I was the ergonomic program manager at the technical center."

In 1992, Roley moved to Geneva, Switzerland and spent the next four years as Cat's European Research manager. In 1996, he started his current position in Standards and Regulations.

"We work to help develop global standards and regulations, and we make sure our machines comply with the standards and regulations around the world," Roley said. "Since 2002, I've been the chairman of the International Standards Organization (ISO) Committee for Earth Moving Machines. Within that committee, I work with many of the key countries to help them participate in that committee and use the ISO standards."

Roley said he has pleasant memories of his time in the Ag Engineering department. "We had a very close group of students who participated in the Ag Engineering activities. I particularly appreciated the

involvement of the professors in our activities. In those days, it was almost like being a part of a big family," he noted. "Butler, Weber, Yoerger - those were the professors I worked with most closely. And of course, there was Dr. Lanham [former Department Head] and Dr. Espenschiede as well."

Roley and his wife Marilyn, BS '72 ACES, live on five acres outside of Peoria. "I enjoy landscaping and we have woods and some farmland. I don't really farm myself, but I do put in some time on the mowing, upkeep and maintenance."

Roley and his wife have three children who all live in the Peoria area and are employed by Caterpillar. They are also graduates of the University of Illinois, as is one son-in-law and one daughter-in-law. "The U of I is an excellent school and it's been a very good place for my family," he said.

Although Roley anticipates retiring (and traveling) in the next few years, he plans to

stay in Peoria. "We have five grandkids here," he concluded, "and I put a priority on doing things with my family."

Dan Roley relaxes with his wife, four granddaughters and one grandson



Wolf Establishing Strong Career in Conservation

Jennifer Wolf '06 TSM, grew up working on her family farm in west central Illinois (near Macomb), and helping her father in his contracting and tilling business. She enjoyed the work and knew she wanted a career in conservation, so she found opportunities to expand upon her knowledge and experience.

“In high school, my FFA project involved surveying and mapping,” Wolf said. “I also volunteered at the Hancock County Soil and Water District the summer before and the summer after my first year of college.”

Wolf came to the University of Illinois in the fall of 2002 as a freshman in Agricultural Engineering. “But physics and I didn’t get along so well,” Wolf said with a laugh. “I knew I wanted to work as a technician and when I realized I didn’t need the engineering degree, technical systems management looked very enticing. I moved to TSM in the spring semester of my sophomore year.”

Wolf was one of six women in the department when she graduated, so “I was definitely a minority. But I’d been a tomboy growing up, so it really didn’t bother me. I could handle myself.” Wolf served as secretary for the Illini Pullers and was also the AEM chairman for the Ag Mech Club. Outside of the department she was a member of Sigma Alpha and played on the Illinois Women’s Rugby team.

After graduation, Wolf took a position with the Jackson County Soil and Water Conservation District. A year later she moved to Iroquois County where she now works for the USDA under the Natural Resources Conservation Service as a soil conservation technician.

“I design waterways and structures for conservation practices,” said Wolf. “Terraces, waterways, toe walls, rock chutes, and conservation practices in general. I also work with government programs such as EQIP and CRP. I write conservation plans for farmers trying nutrient management and looking at the option of no-till or strip-till.”

Wolf noted one particularly satisfying on-the-job experience. “On one of my CRP waterways, I worked with a tenant who had a concern in his field. We looked at it, and then I did a survey on it and came up with a cost estimate for the project. I met with the landowners to show them what their options would be. Sometimes there are multiple options, and sometimes there aren’t, but I usually try to have at least one alternative. They decided what they wanted to do, we got a contract signed and the contractor got it done, seeded and into place.”

The landowners, who had just inherited the farm, later sent Wolf a letter, thanking her for a job well done. “It was quite a learning experience for them, and they were very happy with the waterway,” said Wolf. “It’s good to know that what I do is important to the farmers. On days when I’m fighting the system and it seems like nothing’s going my way, it makes it all worthwhile to know that there was one day when it did.”

Wolf spends most of her free time scrapbooking, traveling to see friends, or going home to help farm. She plans to continue her career in conservation while taking a more active role in the family farm. “I’ve never been a desk person,” she said, “and I love the opportunity to be out in the field. This job fits me.”



Jennifer Wolf works a booth at the Farm Progress Show where participants play Conservation Jeopardy

“It’s good to know that what I do is important to the farmers. On days when I’m fighting the system and it seems like nothing’s going my way, it makes it all worthwhile to know that there was one day when it did.”

— Jennifer Wolf

ABE 100 Competition Caps Successful Semester

The following awards were presented to the winning teams:

BEST POSTER (three-way tie)

Team Aggies, Steam, and Keeping It Soil

BEST PRESENTATION

Illini Boaters

Blogging Botany and Steam
(runners-up)

BEST TEAM WORK

Keeping It Soil

Team Big Green and Absolut Illini
(runners-up)

BEST TEAM NAME AND LOGO

Brewskies

Keeping It Soil and Water Warriors
(runners-up)

BEST STEAM CAR PERFORMANCE

Steam

Soil erosion, steam-powered cars and algae cultivation are just three of the topics addressed by students at this year's ABE 100 Poster Presentation and Micro-Steam Car Demonstration. Students new to the area of agricultural and biological engineering are introduced to the engineering profession in ABE 100. The class is designed to present concepts necessary for becoming a successful engineer, including time management, design concepts, ethics, and teambuilding. The class culminates with the team project design competition that promotes peer learning and effective communication.

"The team members are mentored by older undergraduates who have already taken the course," said Grace Danao, an assistant professor in the Department of ABE. "I tell each class that I'll be calling on them to help mentor the next class. When freshmen learn from other students who know what the class is about, it's less intimidating and it creates a friendly environment to work in."

For almost a decade, team projects all focused on building micro-steam cars from a kit, and a competition was held to see which car travelled the farthest. In 2008, Danao and Dr. Angela Green, an assistant professor in ABE, decided to change the focus of the class to allow projects that addressed all the areas of specialization in ABE – bioenvironmental, biological, food and bioprocess, off-road equipment and soil and water resources engineering.

After the teams were chosen and the projects were approved, students discussed effective communication, teambuilding and presentation in class, but most teams worked on their projects outside of class time.

To prepare for the competition, teams were required to design a poster describing their project. "I pulled up the posters from the previous year and we critiqued every single one of them," said Danao. "We talked about what's good and what to watch out for. So comparatively, each year's posters are better than the last. At least that's the idea."

Students are also required to present their projects to judges and the general public at the competition, so instruction on an effective presentation is another aspect of the class.

"Simple things," said Danao, "like don't talk too fast, make sure the person listening can absorb the information you're giving them, and share the responsibility of the presentation with everyone – make sure everybody's involved."

This year's competition was held on December 3, 2009. Twelve judges were chosen, including five professors from the Department of ABE, five graduate students from the Department of ABE, and two engineers from iFoundry, The Illinois Foundry for Innovation in Engineering Education.

Following is a short summary of all team projects. Photos from the competition can be viewed at: <http://abe-research.illinois.edu/Courses/abe100/F09Results.pdf>.

Team Big Green (Matt Doherty, Nichole Evans, Torin Lacher, Linhui Qi)

This team studied the efficiency of the greenhouse curtains at the greenhouses on the ACES campus. Their main objective was to determine how efficient the shades are at containing heat and controlling the temperature. They determined that the room with seals and curtains saved approximately three times the energy than the room without seals and curtains.

When Pigs Fly (Benjamin Baechle, Justin Bartasius, Ethan Delp, Matt Martin)

Students evaluated ammonia sensors under reduced atmosphere to determine if there is an effect of decreased atmospheric pressure on ammonia sensors that might make them unreliable for ammonia measurement during flight. The sensors remained consistent up to 3000 feet, but higher elevations showed more variation, and there was no evident consistency as to which sensor deviated from the others.

Energy of the Future (Kelsey Green, Alex Salas, Jessica Williams, Evan Wool)

This team studied small scale algae cultivation to determine the maximum growth reached by a strain of algae in two different solutions, and to compare the growth curves of algae grown in a plate versus those grown in a flask. The algae grew best in a 1:50 ratio solution (as compared to the 1:100 ratio).



Members of Steam pose with their winning micro steam car and winning poster; from left: Mingyang Jiang, Ritchie Cervantes, Kevin Verlee, Kirk Beutke

They also proposed that the flask was not as auspicious an environment as the plate because the shear surface area decreased the amount of reproduction of the algae.

Blogging Botany (Marissa Castillo, Cody Lindsey, Ryan Slaughter, Raphael Stern)

The Botanicalls sensor is a tool that measures the moisture of a plant. Blogging Botany's goal was to test the device's accuracy, and to recalibrate it in order to yield a more precise reading. Through their experiment they were able to find an equation that accounted for the error in the sensor reading. After entering the equation into the code of the device, they were able to create a more accurate sensor overall.

Brewskies (Tim Kruckeberg, John Lawrence, Pae Khumwan, Zach Starzyk)

The goal of this team was to determine the optimum enzyme dose that would maximize the efficiency of producing ethanol from corn using the fermentation process. According to their work, 20 micro-liters of GSHE enzyme works optimum in terms of higher ethanol concentrations and fermentation efficiency which in turn will help boost plant efficiency.



Above: The Energy of the Future Project members with their poster; from left: Evan Wool, Kelsey Green, Alex Salas, Jessica Williams



Left: The Water Warriors, runners-up in the Best Team Name and Logo competition; from left: Ben Joseph, Matt Gorski, Chris Santimauro, Emily Cross

Absolut Illini (Chris Hahne, Jim Hineline, Emma Kuester, Jaclyn Burke)

The objective in this experiment was to vary the amount of yeast in order to see what effect it had on the total ethanol produced by a certain amount of corn starch and enzymes. Too much yeast caused the yeast to die off because there was not enough produced for all the organisms to survive off of, causing waste and inefficiency. Too little yeast did not convert enough of the glucose to ethanol, again causing waste and inefficiency.

"I tell each class that I'll be calling on them to help mentor the next class. When freshmen learn from other students who know what the class is about, it's less intimidating and it creates a friendly environment to work in."

— Grace Danao

continued on page 8

ABE 100 Competition Caps Successful Semester

continued from page 7



The Illini Boaters, winners of the Best Presentation competition, with their creation; from left: Delayne Durdle, Aaron Schubert, Austin Roepke, Zach Brammeier

Team Aggies (Chris Devlin, Brian Keller, Jake Larson, Jordan Lutz)
 This experiment entailed an evaluation of Commander In Chief, The Illini Pullers' tractor from 2005, in order to improve the tractor's performance. After analyzing the data, the team learned that placing all of the weight on the front of the tractor allowed for maximum pulling performance. Optimal traction was achieved with this distribution scheme because it helped counter the increasing weight on the rear axle, thus keeping all tires on the ground. Although the counter weight proved effective, they concluded that traction continually decreased as weight was transferred to the rear axle until the tractor was unable to pull any further.

Steam (Kirk Beutke, Ritchie Cervantes, Mingyang Jiang, Kevin Verlee)

Steam Team (Jack Berg, Gage Braley, Patrick Hennessy, Tyler Norman)

Lean Mean Steam Team (Mark Colgan, Nate Gibbons, Christian Kilby, Su Jung Lee)

The teams' objective was to construct a long flame driven steam turbine powered car, and to obtain the greatest distance traveled in comparison to the other steam car teams. The initial test run revealed flaws in the soldering, resulting in the cars not moving. After minor improvements in the soldering were made, Steam's car ran for 280 feet while the Steam Team's car traveled 600 feet.

Keeping it Soil (Leigha Curtin, Michelle Kwak, Allison Melko, Patricia Paulausky)

This team studied prevention of soil erosion using one control bed, two beds of mulch in different arrangements and two beds of small rocks in different arrangements. Overall, the bed covered entirely in ¼ inch of mulch was found to be the most effective design in terms of the lowest concentration of soil in the runoff, lowest volume of runoff, and highest time to prevent visible runoff.

Water Warriors (Emily Cross, Matt Gorski, Ben Joseph, Chris Santimauro)

Using only water, this team tried to launch a beach ball from one endpoint to another using a semicircular path. Unfortunately, the water pressure of the pump they used was too high for the fountain they had constructed. However, before the fountain collapsed, the ball did make one revolution, proving that it was not the design that was flawed, but the instability of the piping versus the torrent of water the pump created.

Illini Boaters (Zach Brammeier, Delayne Durdle, Austin Roepke, Aaron Schubert)

The main objective of this project was to provide a boat for use on a pond on the ABE South Farms. This boat was needed in order to collect data from the pond that is otherwise unattainable. This project was not a traditional ABE 100 project. Instead of setting up an experiment and collecting data, they were given a task and parameters for a final product. The result was a boat that can be propelled by either a person or by a motor, monitor the depth of a pond and power itself. Also, the systems designed for balancing the boat while it is in water and how to remove it from the water are a part of the results.

Save the Date to Celebrate ABE@Illinois on September 17-18th, 2010. Visit abe.illinois.edu for updates and information.

U of I Ties with Berkeley for Best Software Tool at 2009 iGEM competition

-- with contributions from LeAnn Ormsby

Students from a variety of departments on the campus of the University of Illinois participated, for the second time, in the 2009 International Genetically Engineered Machine (iGEM) competition.

"Last year we took one team, this year we took two," said Kaustubh Bhalerao, assistant professor in Agricultural and Biological Engineering and one of four advisors for the team. "It was the first year for our tools team, and we tied with Berkeley for *Best Software Tool*."

Illinois' entry in the competition was titled Interactive Metabolic Pathway (IMP) Tools. According to the team's website, "IMP Tools is an open source, web-based program that involves model-guided cellular engineering where new metabolic functions can be added to existing microorganisms. This program will assist in the design stage of synthetic biology research. It takes a user-defined input compound, output compound, and weighting scheme and determines the ideal pathway from the starting to the ending compound. Our program presents an exciting capability to help transform important processes in the world for applications ranging from bioremediation to biofuels."

Synthetic biology is a new area of research that combines science and engineering in order to design and build or "synthesize" novel biological functions and systems. Through this new technology, many scientists believe it may be possible to control biological systems to increase food supplies, produce energy, enhance human health, protect the environment, and more.

The iGEM competition is the premiere undergraduate synthetic biology competition. Student teams are given a kit of biological parts at the beginning of the summer from the Registry of Standard Biological Parts. Working at their own schools over the summer, they use these parts and new parts of their own design to build biological systems and operate them in living cells.

The competition is held at the Massachusetts Institute of Technology in Cambridge. It grew from a summer competition with five teams in

2004 to an international event with more than 110 teams and 1200 participants in 2009.

Bhalerao said the project cost approximately \$30,000 and was funded by the Institute for Genomic Biology and the Engineering Design Council. He is looking forward to advising next year's team.

"Synthetic biology is an entirely new discipline," Bhalerao said. "To compare it with electronics, where it's drawing a lot of its ideas and terminology from, we are at the stage of developing the transistor."

"I know that less than one tenth of one percent of the public has even heard of synthetic biology," he concluded. "But look at this competition. It's grown almost exponentially in the last five years, and now there are more than 6,000 students who have participated and are going out into the world with their ideas about synthetic biology. This type of technology is going to allow us to think about novel solutions to serious problems."



The 2009 iGEM team at Massachusetts Institute of Technology for the competition.

Department of Agricultural and Biological Engineering Shines at ExplorACES and Engineering Open House

High school students, their parents and the general public came to the University of Illinois campus on Friday, March 12th and Saturday, March 13th to **ExplorACES** and **Engineering Open House**.

ExplorACES is a two-day event designed to introduce high school students and their families to the College of Agricultural, Consumer and Environmental Sciences (ACES) at the University of Illinois at Urbana-Champaign. It coincides with the annual **Engineering Open House (EOH)**, which showcases student and College accomplishments through a variety of exhibits and presentations.

“Because the Department of Agricultural and Biological Engineering is in both the College of ACES and the College of Engineering, we have the opportunity to showcase our education programs, research and student activities across the campus,” said Scott Bretthauer, Extension Specialist in the Department of ABE. Bretthauer works with students and faculty to coordinate the Department’s exhibits. “Every year we have several exhibits in the Digital Computer Lab (DCL) on the Engineering campus as well as multiple exhibits here at Agricultural Engineering Sciences Building (AESB).”

Exhibits at DCL this year included the cloud chamber, billed as an opportunity to see “cosmic particles from outer space.” The exhibit demonstrates a method that makes elementary particles visible, said Tony Grift, an associate professor in ABE. “In the cloud chamber, alcohol is vaporized and drawn to a dry-ice cooled metal plate. The alcohol is super-saturated and when alpha particles pass through the vapor, they ionize the alcohol molecules and form a condensation trail.”

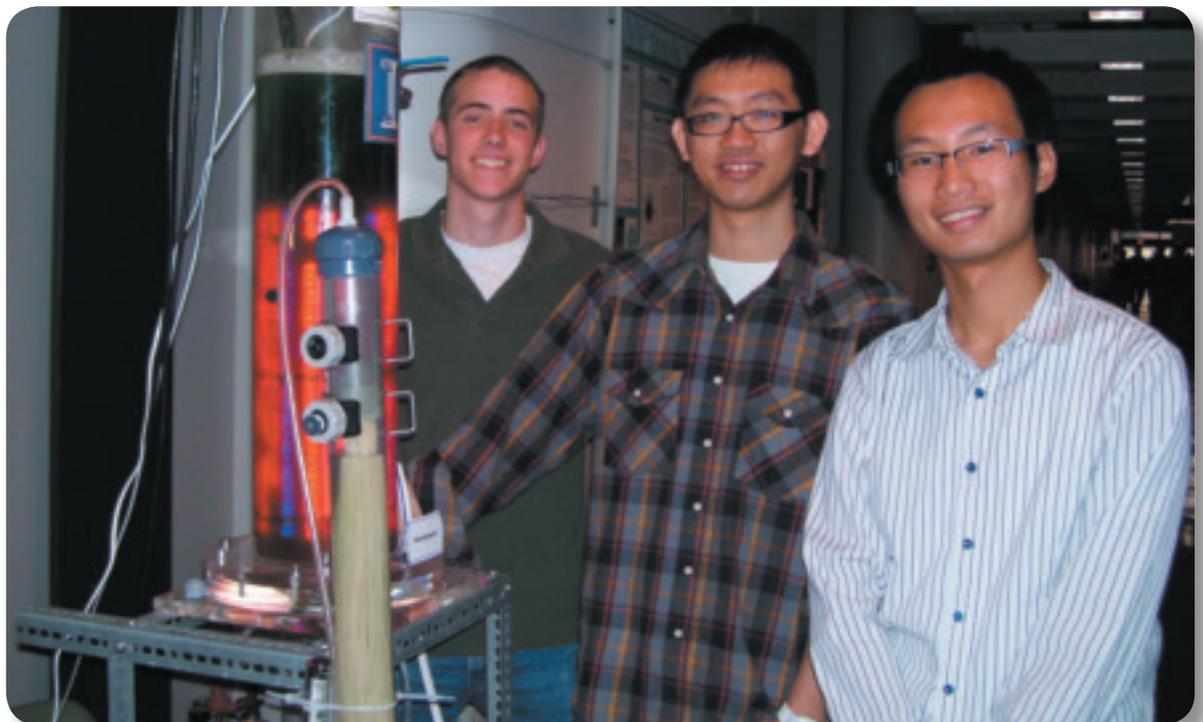
Malia Appleford, a graduate student in ABE, worked at the Interactive Carbon Cycle exhibit at DCL. “This is an interactive game where participants become part of a carbon cycle model. The game shows how a complex system model works, and why little changes in the way we use fossil fuels can make a big difference to global warming.”

Members of the student group, the Illini Pullers, had student-built quarter-scale tractors on display at both locations, with their most recent tractor, *The Chief’s Vendetta*, at DCL. *The Chief’s Vendetta* won the 2009 ASABE 1/4 Scale Tractor Design championship.

This page: Students with their demonstration of wastewater treatment. From left: Michael Grimwade, Chi-Ting Kuo, and Yu-Hsien “Simon” Chen

Opposite page, top: Prof. Tony Grift demonstrates the cloud chamber to some visitors

Opposite page, bottom: ABE freshman, Leigha Curtin, with her James Scholar project on water filtration systems



Alpha Epsilon, the honor society for outstanding biological and agricultural engineers, had members available to speak with interested students at DCL. Members of the Illinois student chapter of the American Society of Agricultural and Biological Engineers (ASABE) had an exhibit at both locations and spoke with students about their club experiences and opportunities available through ASABE.

Another popular exhibit at DCL demonstrated a wastewater treatment system that couples two bioenergy producing processes – anaerobic digestion for methane and algae biomass production for oil.

“The feed material used is food waste that is processed through a garbage disposal,” said Chi-Ting Kuo, a graduate student in the Department. Kuo works with Lance Schideman, an assistant professor in the Department. “This material goes into an anaerobic digester, which breaks down volatile organic solids and produces a biogas with methane. “ Kuo said the methane can be burned to produce heat or electricity.

“The water component passes through the anaerobic digester and mixes with the CO₂ from methane combustion,” he continued. “It’s then put into an algae photobioreactor, where algae are cultured and ultimately harvested.” The algae photobioreactor was lit by red and blue LED light that maximizes photosynthetic efficiency and has lower energy input requirements.

The majority of the Department’s exhibits were set up on the first floor of the AESB building, and there was a steady flow of students and parents through the building to view current research projects and student activities.

The corn stalk counter was a new exhibit at AESB this year. The counter is a machine that uses four laser beams and a computer to count corn stalks in a field. A filtering mechanism distinguishes the corn stalks from other objects and counts the plants. Corn stalk diameter and spacing are also measured.

The air cannon - always a popular exhibit among attendees - was set up outside the building. Air cannons are used for various purposes in agriculture (as a puncher-planter or for general safety testing) and participants were able to operate the cannon to shoot tennis balls high into the air.

Potential students and their parents were also able to tour a variety of labs in the building and talk with ABE faculty members. Dr. Angela Green runs the Animal Welfare and Environmental Systems Laboratory, where researchers look at the systems where animals are housed, test animal preferences for housing conditions and measure environmental conditions within animal housing facilities. Grace Danao, an assistant professor in ABE, was available to explain the work of enzymes in food processing and biosensing, and Prasanta Kalita, professor and head of the Soil and Water Resources Division, discussed a variety of topics with parents and students, including soil erosion and flooding, irrigation systems, crop nutrition management and ways to handle stormwater and control sediment.

“**ExplorACES** and **EOH** are always fun and always a success,” Bretthauer concluded. “It’s a great opportunity for our department to show prospective students and the public we really are the best at what we do.”



Research Opportunities Abound for Undergraduate Students



Above: Patricia Paulasky (freshman in ABE) and Loren Anliker add some instrumentation to the chamber

Right: Ed Roy makes adjustments to the gasifier he assembled

Far right: Ed Roy tweaks some nozzles on the spray table he's working on

The Department of Agricultural and Biological Engineering is nationally and internationally acclaimed for the research it conducts, and undergraduate students in the Department are often given the opportunity to participate in that research. Loren Anliker, a sophomore in the *Parkland Pathway to Illinois* program, and Ed Roy, a December 2009 graduate in Technical Systems Management, are two of the most recent students to take advantage of working in a world-class research program.

“My field of concentration is bio-environmental,” said Anliker, “and I’m focusing on agricultural structures. I’m working on a project with Dr. Green [Angela Green is an assistant professor in the Department], and we’re building a preference chamber with four compartments to test animal behavior in different environments.

“The first animals to be tested will be chickens,” said Anliker, “and initially we’ll be testing ammonia, with the different compartments having zero, ten, twenty and forty parts per million ammonia.”

Tunnels connect the compartments, and one chicken will be free to walk between all four compartments. The other birds, called stimulus birds, will be confined to one compartment. Stimulus birds are used to ensure normal behavior in the test bird, who might behave differently if isolated during the tests.

“The concept is to use the chicken as a biosensor to tell you about the condition she’s living in,” said Green. “Where does she eat, where does she drink, where does she sleep? And what is it about the environment she chooses that makes it preferred for eating or drinking or sleeping?”

Green said they will start with chicks and test them periodically through the whole life of the egg-laying hen. They will test birds that have been raised in fresh air as well as birds raised in polluted air. They will also run the study with groups of birds, allowing the whole group to move to see if the results are the same as for an individual bird.

“Eventually we might test cold stress and heat stress,” said Anliker, “and I think they hope to use the chambers in the future to test the behavior of other animals, like turkeys and pigs.”



Anliker is also working with Green on an independent study, looking at the responses of instrumentation to variations in pressure. The ultimate goal is to evaluate the environment of animals being transported on a plane. First, however, the monitoring equipment must be validated for this application. Anliker’s work will evaluate ammonia sensors under reduced atmosphere to determine if there is an effect of decreased atmospheric pressure on ammonia

sensors that might make them unreliable for ammonia measurement during flight.

“Loren is going to write up his research and submit it to the K.K. Barnes paper contest at the annual ASABE meeting,” said Green, “and then we plan to publish it as a technical paper.”

Ed Roy is a recent graduate of the Department, and he currently works in an academic hourly position for the Department. “I’m waiting for the TSM graduate program to open up, so I took the job here to keep my foot in the door and see what happens,” he said.

Roy has been involved in a number of research projects in the Department since he came to the University of Illinois. “For my first project I worked with Dr. Grift [Tony Grift is an associate professor in the Department], and I helped build the first air cannon. The goal behind the air cannon was to test the safety glazing on tractor cab windows,” said Roy. “Its primary application was in forestry. If you’re cutting trees and the saw blade loses a tooth and hits the window, is it going to break or not? Now it’s become one of the most popular exhibits at ExplorACES, because we shoot tennis balls in the air and potatoes through refrigerators. Kids love it.”

Roy also worked with Steven Ford, a research engineer with the Department, to build the new fan chamber for the Bioenvironmental and Structural Systems laboratory. The fan chamber is used to test efficiency rates for agricultural fans.

Last summer, Roy began work with Scott Bretthauer, an Extension specialist in pesticide application and safety. One aspect of Bretthauer’s work entails working with local pilots to determine the pattern and droplet size of pesticides applied by agricultural crop dusters. Roy worked with Bretthauer to help analyze the data obtained from the ‘flyovers.’

“We set up a designated swath area of 150 feet that has a string in it. Then we give the pilots a specific amount of water and dye and they fly over and spray that area,” Roy said. “My job was to analyze the string. The dye on the string will give you an accurate tally as to how much of the spray material is in that area.” Roy is currently working on a portable spray table that Bretthauer will be able to take to shows and demonstrations.

Finally, Roy just began working with Dr. Grift on a second project. “The corn stalk counter is a very simple machine,” said Roy. “It’s a pushcart that uses a combination of lasers and a computer to count the number of germinated corn plants in an experimental field. You push it across the field and it has a filtering mechanism that distinguishes corn stalks from everything else.” Roy said the counter is more accurate than a human because it’s consistent. “If you have high school kids count the plants one at a time, they get tired, or maybe one student will do a better job than another. With the corn stalk counter, you get accuracy.”

Anliker and Roy both say they have learned things they could never get in a classroom, and Roy especially enjoys the hands-on aspect of the work that he’s done.

“Sitting in front of a computer designing something is okay, but I’d much rather build it,” Roy said.



Parkland Pathway to Illinois

Anliker is a participant in the *Parkland Pathway to Illinois* program, which allows him to take much of his coursework in his first two years at Parkland College while building a relationship with his home department of ABE. Students in the program pay Parkland tuition rates but have access to Illinois resources and take up to 5 hours per semester at Illinois. Loren will transfer as a full-time student to the University of Illinois in the fall of 2010. He is one of the Department’s first participants in this unique program, which is available to all Illinois high school graduates. For more information, visit: http://admissions.illinois.edu/apply/app_parkland.html

ABE Futures Committee Expands to Include ABE Futures Council

The Agricultural and Biological Engineering (ABE) Futures Committee has extended its vision for the Department to include the new ABE Futures Council, said Roscoe Pershing, Ph.D. '66 AgE, former Department Head and chairman of the Futures Committee.

"Two years ago, K.C. Ting [the current Department Head] came to me because he wanted to form a committee that would help the Department build enthusiasm among alumni," said Pershing. "So we formed the ABE Futures Committee. Everyone on the Committee is a former faculty member who has a great passion for our program and wants to ensure a strong future for the Department.

"All of us are recently retired," Pershing continued, "and we live in the Champaign-Urbana area. We wanted to expand our ranks to include alumni who are still working, and are active in their communities around the state. We decided to form a 'Futures Council' to aid us in our efforts to enhance and strengthen the Department. Members of this new Council are all people who were strong in their academic careers at the U of I, and have gone on to do wonderful things in their lives and in their careers."

Pershing said the inaugural class of the new Council began with a focus on three significant geographical areas; greater Chicago, greater Peoria and the Quad Cities area. "The Council may grow and cover wider areas in the future," said Pershing, "but this is the beginning focus. Based on the persons accepting the invitation to join us, the Council presently has two from Caterpillar (1-Peoria, 1-Decatur), two from Deere (Quad Cities), one from RHMG Engineering (Chicago area), one from Kraft (Madison, WI), and one from Wills Milling and Hardwoods, Inc. (Carlinville), representing important companies and regions." Pershing said they are also committed to representing both major academic programs (Engineering and Technical Systems Management) on the Council.

Together, the Committee and the Council will continue to work on projects that the Committee began two years ago, such as Celebrate ABE@Illinois, an annual fall celebration that includes informal gatherings, tours of the Department and a banquet; Professor for a Day, a program to engage and honor a special alumnus each semester; improving and expanding the Department's Alumni and Friends database; and promotion of the Department through the website and improved newsletters.

Pershing said the new Council has already made other suggestions that the Department is implementing. "They asked for information cards about the Department that they could take to hand out at meetings of their service organizations or ASABE section meetings. The cards promote the Department and give contact information for anyone who is interested," he said. "They also suggested setting up a Facebook account to help alumni keep in touch with one another, and now the Department has one started."

Pershing said he hopes other Council activities will include assisting with recruitment of high school students in the different regions, and personal contact with alums and friends regarding social and professional events and continuing education opportunities. Council members could also serve as contacts for job opportunities for ABE graduates or provide contacts for faculty research collaboration.

"Our undergraduate program in agricultural and biological engineering has been ranked first in the nation by *U.S. News and World Report* for the past four years," Pershing noted. "That's exciting! And there are so many other developments going on here. Our goal is to help alumni and the general public appreciate and share the excitement of those accomplishments. I think the ABE Futures Council can serve as the 'eyes and ears' of the public regarding Ag and Bio Engineering at the University of Illinois."

Following is a list of the members of the new ABE Futures Council, and the ABE Futures Committee.

ABE Futures Council

Lynda Cabrales – Madison, WI (Kraft)
 Marcia McCutchan – Chicago area (RHMG Engineering)
 John Reid – Quad Cities area (Deere)
 Dan Roley – Peoria area (Cat)
 Anthony Rund – Decatur area (Cat)
 Dave Smith – Quad Cities area (Deere, retired)
 Brian Wills – Carlinville (Wills Milling and Hardwoods, Inc.)

ABE Futures Committee

Roscoe Pershing – Chair
 Paul Benson
 Loren Bode
 Doug Bosworth
 Phil Buriak
 Carroll Goering
 Ben Jones
 (Bob Fry - consultant)
 (Walter Lembke – consultant)
 Kim Meenen – ACES Staff
 Ronda Sullivan -- ABE Staff
 KC Ting – ABE Department Head

Join us for the University of Illinois Alumni and Friends Reception, Monday, June 21st, 2010 during the ASABE Annual International Meeting in Pittsburgh, Pennsylvania.



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 COMPANY

 ADDRESS

 CITY, STATE, ZIP

 PHONE

 EMAIL ADDRESS

International Influence Marks Distinguished Career for Art Muehling
continued from page 3

On another excursion, Muehling was in the Dresden, East Germany area with an acquaintance and wanted to take a picture of some dairy buildings. His friend was reluctant, but he stopped the car and opened the hood.

“He pretended we had car trouble, while I got out and took my picture,” Muehling said. “He was afraid we were being watched.”

When Muehling and his family returned to the States, they traveled nine days on a freighter in order to ship back a Volkswagen station wagon they had picked up in Wolfsburg, Germany. “After being gone a year, it was quite an experience to come in past the Statue of Liberty,” Muehling noted.

On his second sabbatical, Muehling spent six months in Australia and New Zealand. His third sabbatical found him back in Germany (and several other northern European countries) in 1989.

“We were in East Germany in April of ’89, and when my wife talked with some of our friends there, they said things were never going to change. They had no hope. So we just couldn’t believe it when that wall came down later that year, with no conflict whatsoever.”

Additional international activities included serving as a delegation leader for three Illinois Swine Producers People to People Goodwill Missions, and participation in seven professional meetings of the International Commission of Agricultural Engineering (CIGR).

Muehling received a number of prestigious awards during his career, including the Paul A. Funk Award in 1979; election to the Farm Building News, Farm Builder Hall of Fame in 1984; and the Cooperative Extension Service Sustained Excellence in Programs and Service Award in 1986.

Muehling married Mary Long in August of 1956. They have two sons, Tom and Craig, and one granddaughter.

After retirement, Muehling remained active in ag engineering in many areas; he continued management of the Illinois Livestock Waste Management Conference for a number of years, and worked on several international projects.

“I joined a team of four U of I staff members, teaching a one-week swine production seminar to the top swine managers at two locations in China for the American Soybean Association,” said Muehling. “I also

participated in a team sponsored by the World Bank, planning the new swine re-population sites in Haiti [in the early ’90’s]. There were other projects as well, in the Dominican Republic, Panama and Costa Rica.”

In later years, Muehling and his wife traveled to Egypt, Greece and Thailand, and returned to the Panama Canal and Costa Rica. Current hobbies include working in the yard and garden, studying genealogy and following the Fighting Illini.

A dedicated fan, Muehling still shares football and basketball tickets with Jim Curtis, a colleague. “He and I have shared football and basketball tickets for better than forty years,” said Muehling. “They would go to half the games, and we would go to half the games. We still do that, and we still have the same tickets.”

Muehling said, “When I retired in 1992, I asked ‘Where else could I better find a job after leaving the Air Force than at the University of Illinois?’ I’m still looking!”

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