Biological Systems Engineering

Newsletter Spring 2013

Congratulations—BSE Class of 2013!

BSE Annual Banquet

(l-r) Angie Stires, Lory Willard, Sarah Norton—Best Comprehensive Design Poster with Respect to Engineering Design Content and Best Verbal Description of a Comprehensive Project Poster

In May, the department held its annual banquet at the Stuart-Alphin Arena facility, attended by over 100 faculty, staff, and students. The event was hosted by the ASABE Student Branch and Alpha Epsilon and sponsored by the BSE Department. The program began with a Senior Design poster session and reception, followed by dinner, the Alpha Epsilon new member induction, and awards. This was the first year that awards were presented for Senior Design posters. All the awards and winners are listed on page 5. BSE Outstanding Students (see page 7) were also recognized, as well as recipients of Alpha Epsilon and ASABE Student Branch awards.

In this issue…

BSE Annual Spring Commencement Reception

More pictures of the commencement reception on the back cover!

VirginiaTech Invent the Future

Department News

Dear BSE alumni and friends,

It is always enjoyable to reflect on the accomplishments of students, staff, and faculty when I write this letter to you. In this issue, you will read about accomplishments related to our academic, research, and extension programs. You will also read about activities of some alumni – it is always a pleasure to receive updates (and visits) from alumni – please send an update and visit!

In this issue, you will read about the ten senior design projects that were completed by our 31 BSE seniors during the 2012-2013 academic year and see the variety of projects the students completed. Over the past few years, we have been working to continuously improve the senior (comprehensive) design experience. For example, practicing engineers are now serving as professional mentors on most of the projects (goal is for all projects) and, this year, several teams submitted their designs to national design competitions. Congratulations to the two teams whose designs were selected for regional or national awards! Effective for the 2013-2014 offering of the design experience, we have increased the course credits from 2 to 3 to better match the work load for the students and to enhance the role of the faculty advisors in the process. We also are moving towards including a build-test-modify phase to the design process. With some space in Seitz Hall becoming available due to the opening of the HABB1 building (more information below), we are developing plans for a senior design studio and workshop in Seitz. We are always looking for professional and industrial involvement in senior design. If you have an idea for a project and/or would be willing to serve as a professional mentor to a design team, please let us know. Our students benefit enormously from interacting with you, and I am sure that you will enjoy working with them as well!

I am very pleased to let you know that we are in the process of hiring three new faculty members. Two of them are part of a "water" cluster in the College of Agriculture and

(Continued on page 3)

HABB1 Update

Construction of the Human and Agricultural Biosciences Building 1 (HABB1) is on schedule for completion in November 2013. As described in previous newsletters, HABB1 is a research building that will be shared by the BSE department and the Department of Food Science and Technology. At an executive review meeting in May, the contractor reviewed all phases of the construction and led a tour of the facility. A particularly interesting part of the discussion concerned the Hokie Stone Veneer System.

The process starts with stainless steel flashings attached at grade level. The flashings are sealed to the stone and back up structure using joint sealants. At all overlaps, a secondary layer of sheet flashing is installed over the stainless steel elements to ensure no water infiltration underneath the elements. The stone process continues with: stainless steel anchor placement, masonry tie anchored pre cast banding, intermediate flashings/weeps, and drain board/mortar netting. Soft joints and control joints are used at relief points throughout the elevations of the building and are filled with backer rod and joint sealant to aid in sealing off the cavity. There is Hokie Stone on pillars inside the building as well as on the outside of the building.

For the next newsletter, we will have pictures of the finished building and BSE researchers hard at work in the new labs!■

Visit our website:

http://www.bse.vt.edu/

(Continued from page 2)

Life Sciences (CALS) and in the College of Natural Resources and Environment (CNRE) aimed at further increasing the collaboration and expertise of water-related faculty on campus. The third position is in bioprocess engineering; we will be interviewing candidates for that position in early fall.

For the fall 2013 semester, we are looking forward to a successful ABET visit for continued accreditation of our undergraduate program and to the move into the HABB1 building.

Thank you for your interest in and support of the BSE department!

Sincerely,

Mary Leigh Wolfe

Thinking about grad school…

Or know of someone who is?

BSE is accepting applications

Application due date:
Spring 2014: October 1, 2013
Fall 2014: January 15, 2014

For more information, please visit: www.bse.vt.edu/apply

This Issue's Featured Advisory Board Profile

Mike Flagg received his B.S. degree in Agricultural Engineering (now Biological Systems Engineering) from Virginia Tech in 1986. He began his career with the Virginia Department of Conservation and Historic Resources, now the Department of Conservation and Recreation (DCR). While with the DCR in the late 1980's and early 1990's, he was able to work closely with the BSE Department on projects involving the protection of the Chesapeake Bay and its tributaries from non-point source pollution.

Flagg made a career change in 1996, beginning work as the Director of the Hanover Department of Public Works, and has continued his relationship with BSE on issues involving stormwater management. His current work responsibilities include oversight for the airport, solid waste and recycling, capital improvements for building and roads, environmental engineering and development reviews including stormwater management, and erosion and sediment control programs. In the last decade, disaster response and recovery for debris management and infrastructure reconstruction have become important, as various weather related events (e.g. the derecho last summer) have affected the County.

Over time, the Hanover Department of Public Works has been able to work with numerous interns from the university on many projects, including several students from BSE. Virginia Tech student interns have helped Hanover County meet the requirements of an MS4 (Municipal Separate Stormwater Sewer System) program required by the Clean Water Act and lots of other related projects. Flagg is currently serving his second term as an Advisory Board Member for the Biological Systems Engineering Department. He served a previous term from 2000-2006. In 2006, Flagg was recognized as an Outstanding Alumnus for the Biological Systems Engineering Department at Virginia Tech. Mike often reflects on the benefits to his career of his professional relationship with the BSE department and numerous alumni.

Mike and his wife Lisa have three children and reside in Hanover County. They look forward to opportunities to return to the Virginia Tech campus for BSE activities.■

Valued Contributors to BSE (11/1/12 - 4/30/13)

The BSE faculty, staff, and students would like to thank those alumni, friends, and organizations who have generously supported the department through their gifts and donations. We want to ensure that all our donors are recognized and acknowledged, so please contact the department (barbt@vt.edu, mlwolfe@vt.edu) if your name has been omitted. Your contributions are used to provide student scholarships, purchase teaching laboratory equipment, aid in the recruitment of outstanding graduate students, enable students to participate in special projects both domestically and internationally, and allow students to attend professional conferences. Activities that we would like to add or expand through the generous contributions of our alumni and friends include senior design project fabrication and a Distinguished Lecture Series.

Bennett, Teri
Cundiff, John
Ethier, Michael
Finney, Essex
Flagg, J. Michael
Graham, Mark & Katy
Griles, Julius
Hale, Edward
Hale, John
Hall, Corey
Hatcher, Charles
Higgins, Jeffrey
Holmes, Brian
Kenimer, Ann
Lane, Robert
Leach, Charles
Massie, Fred
Morgan, Tracy
Neel, Edward
Perdue, William
Powers, David
Prince, George
Resop, Jonathan
Skinner, Sherwood
Smith, Easley
Smith, John
Thompson, Ralph
Trykowski, Tom
Tweedy, Kevin
Wills, Larry

BSE Student News

ASABE Student Branch News

This semester, the ASABE Chapter at Virginia Tech focused on professional development and new outreach programs. There were several career fairs in the beginning of the spring semester and, in order to prepare for these, **Dr. Ryan Senger** (BSE assistant professor) gave a talk on how to speak to company representatives. Another professional meeting was about learning the rules of etiquette and then practicing our new skills with a Pancake Etiquette Dinner. To mentor future ASABE officers, elections were conducted halfway through the spring semester. We welcome our new officers: **Sarah Nash** (President), **Dylan Cooper** (Vice President), **Sara Gokturk** (Treasurer), and **Jenna Sharkey** (Secretary)!

Stream clean up volunteers (l - r): Dan Flannery, Sarah Jennings, Sara Gokturk, Dr. Tess Thompson, Caroline Tuck, Kimmy Tretick, Rob Wallace, Kayla Reidenbach

In terms of outreach, a guest from the VT Biochemistry Club came to speak about the educational outreach that they do at a local elementary school. In the future, ASABE will be joining the Biochemistry Club at local elementary schools to help with experiments that demonstrate various science concepts and sustainability. Since many of our members are interested in streams and non-point source pollution, we also organized a local stream clean-up this semester. Several students got together and helped **Dr. Tess Thompson** (BSE associate professor) to clean up a local Blacksburg neighborhood, including stream and brush areas. The group filled up seven extra-large bags of trash in just a few hours! Future similar efforts are planned for the BSE StREAM Lab.

- **Michelle Halsted**, ASABE President 2012-2013
Kayla Reidenbach, ASABE Treasurer 2012-2013

GSO (Graduate Student Organization)

This has been a great year for the BSE Graduate Student Organization (GSO). GSO develops activities to enhance the graduate experience by organizing training opportunities, serving as a bridge between students and faculty, and organizing social activities. This fall, GSO co-sponsored the cleanup of Price's Fork Research Center with BSE's honor society Alpha Epsilon (AE), hosted an Endnote software training, and assisted with coordination of the departmental seminar. This spring, we helped coordinate AE's Professional Seminar Series, which features department alumni on topics like transitioning from graduate school to industry. GSO is also hosting a training on how to conduct and participate in efficient meetings for effective outcomes in June 2013.

- Elizabeth "Liz" Collins
GSO President 2012-2013

Brazil Education Abroad

Bom dia! My name is **Jenny Lewis** and I'm a junior studying abroad at Universidade Federal de Santa Maria (UFSM), located in Brazil's southernmost state of Rio Grande do Sul. The culture here is all churrascos (Brazilian-style barbeques), soccer (obviously!), and chimarrão (a type of tea with which the entire state is in love). After two months of intense language preparation, I began my engineering courses, which are taught completely in Portuguese.

The process of learning Portuguese has been difficult, but also fun and filled with many supportive friends and professors. My fear of making mistakes has been replaced with laughter at the silly things I say by accident (and my skills in charades have definitely improved). The Brazilians I've met are so encouraging and excited to see someone putting in the effort to learn their language, that sometimes I even have random people at stores and restaurants teaching me new words. Taking engineering courses in Portuguese is far from easy and requires a lot of work and time (good thing chimarrão is caffeinated), but it is also very rewarding when I am able to understand the concepts in a foreign language.

I've done a lot of traveling since arriving here. My most amazing trip was to Florianópolis, where I stayed in a hostel filled with people from a dozen different countries. Brazil has many unique and beautiful places I want to see, and I have a lot of ground to cover. I'm looking forward to the rest of the time I will spend here, and have until August to see as much as possible, learn a new language, and to meet more people in this warm and welcoming culture.■

2012-2013 BSE Comprehensive Design Projects

Thirty-one BSE seniors completed the requirements of the BSE Comprehensive Design Projects course sequence with 10 design projects. Two were international and dealt with food processing and wastewater treatment in Uganda and Haiti, respectively; three were biomedical related; and the remaining five dealt with water resources protection. For the second year in a row, most projects were mentored by practicing engineers in addition to a faculty advisor. The design teams presented their final design via oral presentations and a poster session in May. The student presentations were judged by members of the BSE Advisory Board and posters were judged by a panel of faculty members. The following student design teams received awards for their presentations:

Best Comprehensive Design Project Oral Presentation
Project: Bioelectric Standardization of Cell Distribution in a Tendon/Ligament Scaffold
Engineers: **Michelle Halsted**, **Daniel Inman**, **Stefanie Pagano**

Best Comprehensive Design Project Poster with Respect to Engineering Design Content -and-
Best Verbal Description of a Comprehensive Design Project Poster
Project: Virginia Tech Duck Pond Sediment Removal Plan
Engineers: **Sarah Norton**, **Angie Stires**, **Lory Willard**

Best in Show Comprehensive Design Project Poster -and-
Best Comprehensive Design Project Poster with Respect to Visual Content
Project: North River Restoration at Natural Chimneys Park
Engineers: **Aaron Estep**, **David McCann**, **Brian Parkhurst**
This team finished second in the written phase of ASABE's G. B. Gunlogson Open Environmental Design Competition. The team will compete in the oral presentation phase of the competition at the ASABE Annual International Meeting in Kansas City in July.

Read more about individual design projects on pages 6-7 and 9!

Fall 2012 Dean's List

Congratulations to the BSE undergraduate students named to the Dean's List for the fall 2012 semester. Undergraduate students must attempt at least 12 credit hours graded on the A-F option and earn a minimum 3.4 grade point average (on a 4.0 scale) during the spring or fall semester to be awarded Virginia Tech Dean's List status.

BSE Sophomores (in fall 2012)
Lindsay Carr
Sasha Howes
Anish Luthra
Austin Moon
Maryjoe Rice
Scott-Eugene Saverot
Michael Scimeca
Xunuo Shen
Nancy Stevenson
Jordan Wetzig

BSE Juniors (in fall 2012)
Jaclyn Einstein
David Gong
Joshua Gozum
Kinsey Hoffman
Cassidy Owen
Brian Shenk
Michael Swartz
Aishwarya Venkat

BSE Seniors (in fall 2012)
Catherine Colandro
Aaron Estep
Daniel Inman
David McCann
Bradley Morrison
Aneela Mousam
Daniel Neighbors
Sarah Norton
Stefanie Pagano
Brian Parkhurst
Kayla Reidenbach
Bryan Ringgold
Alexander Simon
Jeffrey Smith
Angela Stires
Nicole Szanyi
Caroline Tuck
Lory Willard

Alpha Epsilon (BSE honor society)

The Virginia Eta Chapter of Alpha Epsilon organized several service projects this year, including a departmental holiday clothing drive in December 2012 to benefit the Montgomery County Emergency Assistance Program (MCEAP), maintenance of BSE alumna Julia Pryde's memorial garden in the Ag Quad, and ongoing revision of our "Sustainability Kits" for SEEDS (Seek Education, Explore, DiScover) in Blacksburg. These kits are educational tools developed by Alpha Epsilon to help teach concepts related to sustainable agriculture, energy, transportation, recycling, composting, etc. to K-5 kids in an easy and interactive way.

Julia Pryde Memorial Garden maintenance: (front l-r): Winfred Mbungu, Caitlin Rippner; (back l-r): Dr. Mary Leigh Wolfe, Hadi Nazem-Bokaee, Liz Collins, Brian Parkhurst, Chris Whysong

The chapter also started a new program, the "AE Speaker Series", to promote professionalism and provide career development opportunities for BSE students. The first seminar was held in March 2013. **Brad Matanin** (BS '05, MS '07), an associate scientist with MedImmune based in Maryland, shared his experiences transitioning from university to industry. Brad spent his one-day stay in Blacksburg touring the BSE department and labs, and meeting with several faculty and student groups.

Fourteen new members were inducted during the BSE Spring Banquet in May. The Outstanding Faculty and Staff Awards were also presented at the banquet.

- **Hadi Nazem-Bokaee,** AE President 2012-2013

Senior Design Travels

Two of our 2012-13 BSE Senior Design teams traveled far this past year to complete projects for various international partners.

"Last November, we traveled to Uganda for our senior design project with our faculty mentor, **Dr. Kumar Mallikarjunan**. Our project is focused on scaling up a peanut processing facility, and we were able to meet our client, Henry Rugumira, in person outside Kampala. This meeting helped narrow the scope of the project and greatly benefitted our design.

We traveled throughout Uganda to visit various peanut facilities, varying from vendors in the marketplace to the largest processing facility in Uganda, and toured Makerere University, which is where some peanut facilities have aflatoxin testing done. Dr. Kaaya, a professor at the university and our professional mentor, showed us around the country. Uganda has problems with water, electricity, regulation enforcement issues, and less affordable resources. We had prior knowledge about these issues, but it meant more to experience it ourselves.

Beyond our daily project tasks, we visited the equatorial line and the source of the Nile, Murchison Falls. We also went on a safari and boat ride on the Nile where we saw giraffes, various deer species, warthogs, baboons, water buffalo, hippos, and elephants. When they saw us, children would yell out "mzungu" or "bzungu," which means "white person" in Swahili, and smile when we waved back. We will remember driving on extremely bumpy Ugandan roads, seeing wild animals, and the food. We enjoyed meeting everyone from Uganda and without them, would not have had as amazing a trip. Thanks to the BSE Department and College of Engineering for their support."

-**Caroline Tuck**, **Nikki Szanyi**, **Taryn Horr**, and **Margaret Delany**
Editor Note: This team's paper "Scale Up of a Peanut Processing Plant in Uganda" was awarded first place in the 2013 Northeast Agricultural and Biological Engineering Conference (NABEC) undergraduate student design competition. They will present the work at the 2013 NABEC-ASABE meeting in Altoona, PA in June.

"Our Senior Design Team traveled to Hinche, Haiti with our faculty advisor, **Dr. Jactone Arogo Ogejo** and our design professor, **Dr. Theo Dillaha**, to meet our client, Dr. Laguerre, the director of the Saint Therese Hospital. The purpose of our trip was to conduct a field assessment of potential sites for the wastewater treatment system we are designing for our senior design project.

When we conversed with people in Haiti and learned about the conditions that we were working with, we realized the importance of our design, and the benefits of a functioning wastewater treatment system that could meet the hospital's needs. One of the main reasons that projects fail in places like Haiti is the level of maintenance required to keep the project going, as the hospital staff may not have the skills required for maintenance of the system. We also got to see examples of projects that other organizations installed in Haiti that are no longer functioning, like their current water distribution system. From this, we realized how important and difficult it would be to create a design that required minimal operation and maintenance, but still treated the wastewater effectively.

Even though our group only visited Haiti for three days, we realized how much we take potable water, wastewater treatment, and a sophisticated healthcare system for granted in the United States. Overall, the trip helped us recognize the role we can play as engineers to help others and contribute toward international development."

-**Sarah Jennings**, **Aneela Mousam**, and **Kayla Reidenbach**

More Senior Design Projects

Cheatham Hall Green Roof Design Project. Engineers: **Damir Grljevic**, **Bradley Morrison**, and **Kimberly Tretick**. Faculty advisor: **Dr. Tess Thompson**. The client, Dr. Winistorfer, Dean of the College of Natural Resources, requested that a green roof be designed for the main building of the College of Natural Resources, Cheatham Hall, at Virginia Tech. A 186 m^2 section of the roof was available. With no given budget constraints, the client's priorities were to create an attractive green space on the roof adjacent to the college's main conference room, to use the green roof to increase the energy efficiency of the building, and to reduce stormwater runoff from the roof.

Design of a Bioelectric Device to Standardize Cell Distribution in a Tendon/Ligament Scaffold. Engineers: **Michelle Halsted**, **Daniel Inman**, and **Stephanie Pagano**. Faculty advisors: **Dr. Warren Ruder** and **Dr. Robert Grisso**. Client: Dr. Linda Dahlgren. Tendon and ligament injuries occur rather frequently, yet the current recovery methods are inadequate. Many efforts are being made in the field of tissue engineering to generate competent tendons and other tissues ex vivo. This design project involved designing and testing a device to apply an

(Continued on page 7)

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electrical force to collagen gel where stem cells are seeded and to distribute the stem cells in a more uniform manner, thus improving the process being used in the client's research.

Design of a Bioreactor to Convert Hydrocarbon Pollutants to Useful Chemical Intermediates. Engineers: **Adam Hise**, **Parker Lee**, and **Daniel Neighbors**. Faculty advisor: **Dr. Justin Barone**. This design project involved designing a bioreactor system for the Western Virginia Water Authority (WVWA) wastewater treatment plant that uses a hydrocarbon degrading organism to break down waste hydrocarbons and produce commodity bioproduct. Hydrocarbon waste is a contaminant that wastewater treatment facilities must remove from the influent every day in a process which can be expensive. This approach to hydrocarbon remediation is intended to offset the cost of operation with the sale of degradation by-products.

Design of a Sensor System for Ex-Vivo Liver Preservation and Diagnosis. Engineers: **Bill Carswell**, **Amanda Rew**, and **Alexander Simon**. Faculty advisor: **Dr. Ryan Senger**. Professional mentor: Dr. John Robertson. Client: BioMed Innovations LLC. The goal of this design project was to design and integrate a sensor array into the VasoWaveTM system for real-time quantitative assessment of organ viability and prolonged preservation. Organ preservation is critical to prolonging organ health during organ transplantation in present day medical practices. The final sensor array design needed to have the capability to measure output quantitative data related to organ health in real time.

Duck Pond Sediment Removal Design Project. Engineers: **Sarah Norton**, **Angela Stires**, and **Lory Willard**. Faculty advisor: **Dr. Cully Hession**. Professional Mentors: Chuck Dietz, Lauren Grimes, and **John Burke** (BS '04). Client: Virginia Tech Facilities Services - Site and Infrastructure Development. The Virginia Tech Duck Pond is a recreational and unofficial stormwater management structure on the Virginia Tech campus. It has not been dredged since 1986 and its aesthetic appeal and stormwater management capabilities are declining. This project focused on designing a comprehensive plan for sediment removal for the Duck Pond, including which method of sediment removal to use, how to dispose of the sediment, a cost estimate for the project, and the USACE Joint Permit Application. The constraints placed on the project were cost, time taken to complete the project, and state and federal regulations.

MedImmune - Process Optimization Design Project. Engineers: **Catherine Colandro**, **Jeffrey Smith**, and **Robert Wallace**. Faculty advisor: **Dr. Mike Zhang**. Professional mentors: **Matt Dickson** (BSE Advisory Board member), **Brad Matanin** (BS '05, MS '07), and **Kristin Jusino** (BS '06, MS '08). Client: MedImmune LLC. The objective of this project was to design a protein purification process for "Hokie mAb", a fictitious IgG1 monoclonal antibody (mAb). "Hokie mAb" is designed to target a receptor on breast cancer cells. When this mAb binds to the cancer cells, it inhibits an important signaling pathway and prevents the cancer cells from multiplying. The body is then able to defeat the cancer cells using its own immune response. The design project involved designing a purification process to remove process- and product-related impurities before the mAb can be introduced into the human body.

North River Restoration at Natural Chimneys Park Design Project. Engineers: **Aaron Estep**, **David McCann**, and **Brian Parkhurst**. Faculty advisor: **Dr. Conrad Heatwole**. Professional mentors: Brian Wagner, Jon Roller, and Kip Mumaw. Client: Natural Chimneys Park. Natural Chimneys Park, located in Augusta County, Virginia and bordered by the North River, is currently experiencing extensive bank erosion problems.

(Continued on page 9)

BSE Outstanding Student Awards

The department recognized six outstanding graduate and undergraduate students at the annual BSE Spring Banquet. Outstanding Students are nominated based on their academic achievement and are invited to submit materials describing their activities and achievements in academics, service to the department and university, and extracurricular activities. Each student received a plaque and a cash award funded by an endowment provided by **Dr. Saied Mostaghimi**, our previous department head, and his wife, Patty. The six recipients are listed below, with just a sample of their many achievements.

(l-r) Dr. Mary Leigh Wolfe, Zhiguang Zhu, Emily Lassiter, Cassidy Owen, Jacob Cantor, Brian Parkhurst, David McCann, Dr. Saied Mostaghimi

- **Jacob Cantor—***Outstanding Sophomore* was awarded a Cloyd Scholarship for his proposal to work with a rural community in Mexico to develop a sustainable water supply.
- **Cassidy Owen**—*Outstanding Junior* is a registered EMT and has been a member of the Ashland Volunteer Rescue Squad since 2007. He has been a volunteer with the Blacksburg Rescue Squad for 2 years.
- **David McCann—***Outstanding Senior* organizes social and professional events for his classmates, leads efforts to collect food and Christmas gifts for local families in need, and has traveled domestically and abroad to build safe homes for families.
- **Brian Parkhurst—***Outstanding Senior* has moved up in his position at Claytor Lake State Park and has had to supervise crew members and bring assigned tasks to completion correctly and in a timely manner.
- **Emily Lassiter—***Outstanding M.S. Student* motivates others she collaborates with, and her trans-disciplinary approach to problem solving makes her input actively sought by many fellow students and faculty.
- **Zhiguang Zhu—***Outstanding Ph.D. Student* was awarded the Chinese Government Award for Outstanding Self-financed Students Abroad in 2012. A total of 495 Chinese PhD candidates (of more than 440,000 studying abroad in 2011) received the award that year.

Julia Pryde Memorial Travel Grants

The Pryde Memorial Scholarship was established in 2007 to honor the memory and work of BSE alumna **Julia Pryde** (BS ’06, MS ’07), who was deeply committed to the provision of clean water and sound environmental management in developing countries. The scholarship enables current BSE undergraduate and/or graduate students to pursue international opportunities in keeping with Julia’s vision. In their own words, this year’s Pryde Memorial Scholarship awardees reflect on the significance of their experiences abroad:

"I feel honored and more passionate than ever about pursuing my dreams after being awarded the BSE travel grant in Julia’s name. The grant allowed me to travel to West Africa and help provide clean drinking water to more than 400 people. The trip was with the nonprofit organization Community Water Solutions (CWS), and focused on bringing safe drinking water to rural villages in Tamale, Ghana. It was the most unbelievable experience to see how something I take for granted every day can completely change another’s life. Certainly an experience I’ll never forget!"

-**Lindsay Carr**, sophomore

“Through the Julia K. Pryde Scholarship, I was granted an opportunity to visit a university in Lisbon, Portugal for The Natural Capital Project’s Ecosystem Services workshop. There, I learned how to implement technical solutions via a hydrologic model, named InVEST, to encourage social adaptive change. Collaborative watershed maintenance requires a deep understanding of all the stakeholders or beneficiaries involved, including their socioeconomic positions within the community, while respecting decision making processes.”

-**Chris Hickey**, MS Student

“My trip to Costa Rica over Spring Break was inspiring and life altering. The country is a paradise and inspiration to environmentalists, for it uses 95% renewable energy with a goal of being carbon neutral by 2021. I was able to explore five renewable energy plants: solar, wind, geothermal, hydroelectric, and biomass, and saw them up close and in action. My trip also included surprise activities to explore the natural beauty of Costa Rica: hikes to waterfalls, rafting, zip-lining, and surfing at Tamarindo Beach. I have learned so much about renewable energy and myself on this excursion, and would like to thank BSE for making it possible.”

-**Sasha Howes**, sophomore

“The course ‘Sustaining Human Society and the Natural Environment in New Zealand’ was an unforgettable experience that taught me a great deal about sustainability through hands-on experiences which were specifically geared towards New Zealand culture. We were accompanied by a professor from the University of Canterbury who educated us about the nation’s recovery from catastrophic earthquakes in 2011, the efforts to preserve their fourteen National Parks, and the struggles the country is experiencing with their two largest industries; tourism and agriculture. The trip included a circumnavigation of the south island, with each stop leaving us in awe from the knowledge and scenery New Zealand has to offer.”

-**Charles Roco**, sophomore

(Continued from page 7)

This project sought to alleviate the erosion problems by restoring one section of extreme erosion and providing recreational access to the river away from areas where erosion is likely.

Warhill Trail Fish Passage Design Project. Engineers: **Chelsea Carpenter**, **Thomas Consiglio**, and **Jessica Ewing**. Faculty advisors: **Drs. David Sample** and **Durelle Scott.** Professional mentors: **Karen Hall** (BS '11, MS '12) and Daniel Proctor. Client: James City County. The purpose of this project was to design a fish passage through a road culvert system in which fish are currently unable to swim upstream due to shallow depths. The passage must facilitate the migration of fish species upstream while preserving the 100-year storm flood capacity of the culvert system.■

Ideas for Next Year's Senior Design Projects?

We are always looking for good ideas and suggestions for future senior design projects! If you have ideas or suggestions please contact:

Cully Hession at (540) 231-9480
or chession@vt.edu.

A copy of the design proposal template is available at: http://goo.gl/HzgNz.

Graduate student Nick Cook shows off the proceedings of the Environmental Considerations in Energy Production conference. A picture of Nick collecting in-stream data from Callahan Creek in Wise County, VA was selected for the cover.

New BSE Graduate Student (Spring 2013)

MS Student

Felicia Chang / Ruder
BS Biological Sciences, Virginia Tech, 2008

Congratulations to Eight BSE Graduate Students Who Completed Their Degrees in Fall 2012

MS

Hamza Abdellaoui (Advisors: **M. Zhang** and **F. Agblevor**), *Investigation of Poultry Litter Biochar as a Potential Anode for Direct Carbon Fuel Cell.* Hamza is continuing his studies as a doctoral student with Dr. Foster Agblevor at Utah State.

Amel Boukthir (Advisor: **M. Zhang**), *Biological Pretreatment of Lipid-rich Wastes Prior to Anaerobic Digestion.* Amel is seeking to continue her studies toward a PhD.

Katie Brill (Advisor: **W.C. Hession**), *Impacts of Inundation and Season on Greenhouse Gas Fluxes from Low-order Floodplains.* Katie is an environmental/water resources engineer at MapTech, Inc. in Blacksburg, VA.

Mouna Khili (Advisor: **M. Zhang**), *Characterization of Value Added Proteins and Lipids from Microalgae.* Mouna is pursuing a PhD in Tunisia, in collaboration between the National Engineering School of Sfax and an exporting industry located in her native city Siliana.

Devita McCullough (Advisor: **R. Grisso**), *Analysis and Simulation of Switchgrass Harvest Systems for Large-scale Biofuel Production.* Devita is pursuing a PhD in industrial and systems engineering at Virginia Tech.

Waverly Parks (Advisor: **T. Thompson**), *Effect of Water Temperature on Cohesive Soil Erosion*. Waverly is currently seeking a position in water resources engineering.

Imen Tanniche (Advisor: **R. Senger**), *Correlating Antisense RNA Performance with Thermodynamic Calculations.* Imen will be returning to Virginia Tech in the fall to pursue a PhD in biological systems engineering.

PHD

Hande Kaya Celiker (Advisor: **K. Mallikarjunan**), *Mid-Infrared Spectral Characterization of Aflatoxin Contamination in Peanuts.* Hande took some time off after completing her PhD to focus on her infant daughter, and is now seeking employment.








BSE Faculty and Staff News

Krometis Research Group

Since joining the BSE department as an assistant professor two years ago, **Leigh-Anne Krometis** has established a research group investigating connections between the environment and public health. While many of Krometis' projects target infectious disease ecology, reflecting her training in microbiology and epidemiology, recent efforts have expanded to consider non-infectious sources of human health risk as well.

Expanding on her background in waterborne pathogen transport in stormwater, Krometis is involved in several projects based at the BSE StREAM Lab at Stroubles Creek, including efforts to determine the effects of sediments on indicator organism persistence and a study focused on characterizing the overland transport of antibiotic resistant organisms from manure-amended fields. **Cully Hession** (BSE professor) and Krometis also lead a NSF-funded Research Experience for Undergraduates at the StREAM Lab each summer.

Leigh-Anne Krometis on a monitoring trip in Wise County, VA

Additional Krometis Research Group projects focus on the provision of safe drinking water and adequate sanitation in rural regions of the United States. A 2011 grant from USDA-NIFA enabled Krometis to partner with BSE associate professor **Brian Benham**'s successful Virginia Household Water Quality Program, which provides low-cost water quality testing and education to Virginia families reliant on wells, springs, or cisterns as primary drinking water sources. Krometis' students are currently investigating the use of microbial and chemical source tracking techniques to identify sewage intrusion in these systems, as well as examining potential links between observations of lead and fecal indicator bacteria levels and household demographics. Another ongoing Krometis Research Group project, funded by the Appalachian Research Initiative for Environmental Science, is monitoring a cluster of watersheds in the southern coalfields to determine the relative impacts of mountaintop removal mining discharges and straight pipe sewage discharge on downstream human and ecological health.

Current Krometis Research Group graduate students include: **Nick Cook**, **Hehuan Liao**, **Kelsey Pieper**, and **Tammy Smith**. These students are aided by several undergraduate research assistants, including: **Nick Geroux**, **Sara Gokturk**, **Vickie Nystrom**, and **Julia Sherry**.■

New Ways to Create Food, Fuel

BSE associate professor **Y.H. Percival Zhang**'s breakthroughs in extracting hydrogen from plants were recently featured in a university spotlight on achievement. Below are some excerpts.

Two of Zhang's projects involving the manipulation of carbohydrates have received an enormous amount of attention around the world. One paper he published highlights how he has been able to extract large amounts of hydrogen from any plant, a breakthrough that has the potential to bring a low-cost, environmentally friendly fuel source to the world.

"Our new process could help end our dependence on fossil fuels," he said. "Hydrogen is one of the most important biofuels of the future."

On the surface, hydrogen fuel might not seem to have much to do with creating a new food source, but Zhang used an extraction process similar to the method he employed for hydrogen to come up with a novel way to manufacture one of the main components of the human diet. The second paper demonstrates how he has been able to create starch from plants not traditionally thought of as a food source. This would allow farmers to grow a large amount of biomass on marginal lands for food and biofuel without requiring fertilizers, pesticides, and massive amounts of water.

All this revolutionary work involves a pot of enzymes.

To read the complete article:
http://www.vt.edu/spotlight/achievement/2013-05-13-discoveries/zhang.html

Intro to BSE

Over sixty students enrolled in BSE 2004, Introduction to BSE, in fall 2012. As in the past, the course consisted of a one-hour lecture and a three-hour lab each week. **Mike Zhang** (BSE associate professor) served as the overall coordinating instructor and taught the majority of lectures, with guest lectures and labs taught by BSE faculty **Mary Leigh Wolfe**, **Tess Thompson**, **Durelle Scott**, **Leigh-Anne Krometis**, **Ryan Senger**, and **Justin Barone**.

Over the semester, the students gained significant hands-on experience by conducting six separate laboratory exercises covering areas from environmental and watershed monitoring to bioprocess engineering-related biofuel production and biopharmaceuticals. The class culminated with a team design project, Sedimentation Chamber Design, in which the students used design principles they had learned during the semester. The student responses have been overwhelmingly positive, ie:

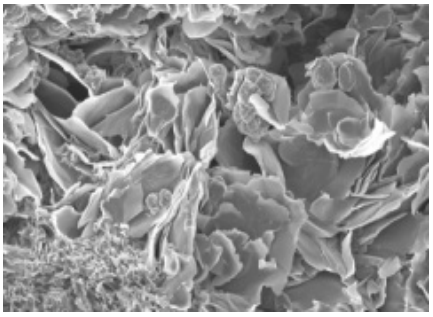
"I enjoyed having different professors come in and teach subject areas that they were familiar with and passionate about"■

Congratulations!

Born in December 2012, Eliot Samuel Scott has been a joy to **Durelle Scott** (BSE assistant professor) and his wife Jennifer from the start. He has been graced with a chill, happy personality. Sisters Beatrice and Nola have made him feel right at home and his big dogs Maka and Kipenzie give him lots of gentle love. His family trusts that his first visits to the beach this summer will make him a water lover like his papa, and his volunteer work with his mom at the refugee office in Roanoke will spark his cultural curiosity!■

The Art of Science

Magnified "microscopic masterpieces" from the College of Agriculture and Life Sciences exploring the intersection of art and science were featured in an exhibition displayed in January at the Armory Gallery. **Justin Barone's** (BSE associate professor) entry was selected to represent the BSE Department in this exhibit. The original is now on display on the first floor of Seitz Hall. You can also hear Dr. Barone narrating the video in the link below.



A protein flower garden: protein nanosheets curling into rosettes (magnification is 5000x)

http://www.vt.edu/spotlight/achievement/2013-01-14-art/science.html

Grisso Promoted to Associate Director

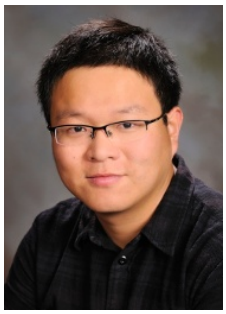
Robert "Bobby" Grisso, professor of BSE and farm equipment and safety specialist, has been named associate director of agriculture and natural resources for Virginia Cooperative Extension (VCE). In this role, Grisso works closely with industry partners, stakeholders, and other state agencies and university programs at Virginia Tech and Virginia State University to identify critical issues and develop knowledge-based resources to address the needs of Virginia's agriculture and natural resources sectors. "I am looking forward to the challenge of making Extension programs more effective and accessible to our Virginia clientele," he said. He likes the opportunity to effectively form teams between the field agents and specialists to deliver educational programs.

"We are extremely pleased that Dr. Grisso is serving Extension in this capacity," said Edwin Jones, associate dean and director of VCE. "He brings years of experience developing programming, collaborating with agents, and engaging stakeholders. We look forward to using his expertise in this leadership role."■

BSE Extension Group Receives Florence Hall Award

BSE faculty **Brian Benham** and **Leigh-Anne Krometis**, BSE Water Quality Extension Associate **Erin Ling** and BSE Water Quality Lab Manager **Kelly Peeler** were recognized with the Florence Hall Award, a state award through the National Extension Association of Family and Consumer Science (NEAFCS). The Florence Hall Award is presented for an outstanding program conducted by one or more NEAFCS members who have been alert in recognizing new concerns and interests of families and have involved people in planning and implementing programs that benefit families. The BSE group was recognized for their work associated with the Southside, VA drinking water clinics conducted in August and September 2012.■

New Postdoctoral Associate



Peng Qi joined the department in November 2012. He received his PhD and MS in Genetics from the University of Chinese Academy of Sciences in 2013 and 2008, respectively. He also received a BS in Life Sciences from Nanjing University. Qi is now working as a postdoctoral research associate under the guidance of **Percival Zhang** (BSE associate professor) in the area of metabolic engineering. His research goals include: (1) engineering the cofactor preference of redox enzymes from natural ones (e.g., NAD, NADP) to low-cost stable biomimetic ones; and (2) increasing enzyme stability by directed evolution. Qi's personal hobbies include photography and badminton.■

New Visiting Scholar

Wenping Lyu, a visiting scholar from China, is an associate professor in the School of Food Science, Jiangnan University, China. He joined the BSE Department in March 2013. He received his BS degree in Animal Science from Shanxi Agricultural University, his MS degree in Animal Nutrition and Feed Science from Shanxi Agricultural University, and his PhD degree in Animal Nutrition and Feed Science from Zhejiang University. Lyu's research interests are focused on cell-free biosystems for the production of biofuels and high-density cell fermentation for recombinant protein production. While at Virginia Tech, Lyu is working with **Percival Zhang** (BSE associate professor) in the Biofuels Laboratory. In his spare time Lyu's personal interests include long-distance running and badminton.■

Spotlight on Grants

Enabling Phenotype Predictions of Cyanobacteria

Ryan Senger, BSE assistant professor, is principal investigator of a new NSF project to investigate the basic metabolic activity of cyanobacteria. Eva Collakova, of the Department of Plant Pathology, Physiology, and Weed Science, is co-principal investigator. Cyanobacteria are bacteria that grow using CO_2 as a carbon source along with natural sunlight. Since these organisms grow on CO_2 and light, cyanobacteria may ultimately be used to replace "corn ethanol" production by yeast and end the important "food to fuels" debate. In order to achieve this goal, more must be learned about the basic metabolic activity of cyanobacteria. With a clearer understanding of metabolism, new metabolic pathways can be installed in cyanobacteria. This will allow the organism to convert CO_2 and light into products such as ethanol, butanol, biodiesel, alkane biofuels, and eventually any of the commodity chemicals we currently obtain from a barrel of oil. A "phenotype predictor" algorithm will be developed to compare and reconcile two methods used to obtain measurements of the cyanobacterium metabolic activity and will predict the resulting cell composition along with an accurate portrayal of how metabolites are distributed throughout the metabolic network of the organism. This will allow scientists to instantly and inexpensively determine very complex characteristics of a growing culture. The project has been funded for three years.

Engineering Probiotic Gut Bacteria to Enhance Human Performance

Warren Ruder, BSE assistant professor, is leading Virginia Tech's effort in a four-year research project sponsored by the Air Force Office of Scientific Research that seeks to engineer probiotic gut bacteria to enhance human performance. In the past few years, several exciting findings have been reported that strengthen our understanding of the link between host physiology and symbiotic microbes. The collection of all of the microbes harbored by an animal's body, also known as the "microbiome," significantly affects animals ranging from insects to humans. We humans already take advantage of microbiomes' beneficial effect by doing things like eating yogurt filled with live probiotic bacteria. In collaboration with partners at Carnegie Mellon University, Ruder's team will be focused on engineering synthetic gene circuits in probiotic gut bacteria - bacteria that already benefit us - to further enhance them to secrete vitamins and other naturally occurring molecules at specific times.■

Rosebrough Receives Diversity Award

Susan Rosebrough, BSE academic programs coordinator, was selected to receive the Diversity Enhancement Award given by the College of Agriculture and Life Sciences Diversity Council. Rosebrough was recently appointed to serve as an at-large member on the university Commission on Equal Opportunity and Diversity and is a Virginia Tech Safe Zone member. She also actively works to diplomatically challenge biased attitudes on a daily basis. The award includes a letter of commendation, a plaque, and a monetary award.

(l-r) Barbara Leshyn, Chair CALS Diversity Council; Susan Rosebrough; Dean Alan Grant, College of Agriculture and Life Sciences

Alumni Updates

1960's

Joseph Gardner (BS '62) has retired from NASA/Johnson Space Center and is now working as an independent financial planner. He has published a book, "Taking Charge of Your Money", and recently spent two weeks in Switzerland.

1980's

Col. William David Brinkley, USA (ret.) (BS '82) served 27 years of active duty in the US Army Corps of Engineers. He retired in 2010 as a colonel. During his service, he served multiple overseas tours, including Iraq, Kuwait, Turkey, Bosnia, Germany, and Korea. David is now the Deputy Chief of Staff Operations and Plans of the US Army Training and Doctrine Command at Fort Eustis, VA.

Deborah Cook (MS '82), is a professor of business information technology in the Pamplin College of Business at Virginia Tech. Her research focuses on the development and implementation of techniques to facilitate process improvement within business and manufacturing settings. She was recently named the Verizon Professor in Business Technology in recognition of her excellence in teaching and research. See the complete VT News article:
http://goo.gl/k17O5

1990's

Hahns Hairston (BS '95) works for the Washington Suburban Sanitary Commission as a plant engineering supervisor at the Potomac Water Filtration Plant in Potomac, Maryland. Hahns and his family visited the department in March.

Corey Hall (BS '97, M.Eng, '00) is currently working as an Industrial Base Project Engineer for the U.S. Army Program Manager for Maneuver Ammunition Systems at Picatinny Arsenal in New Jersey. He and his wife Maggie welcomed their third daughter, Olive, into the world in March 2013. Big sisters Sydney and Violet are very excited with the new family member!

2000's

Steve Collins (BS '03) received his master of engineering from University of Florida. He has been working for an environmental consulting firm in Columbia, MD for the past seven years and earned his PE in civil engineering in 2009. For the past three years, he has also been working on his PhD in ecology at Texas Tech in Lubbock, TX using niche modeling to predict the distribution of imperiled riverine dragonflies. He and his wife celebrated their 9th anniversary in August.

Jennifer Lee Johnson (BS '04) and her husband, Taylour Johnson, just welcomed their first baby, Beckett Landsdowne Johnson in September 2012. New mom Jennifer writes, "He's such a happy baby. He was 7 lbs, 6 oz and 20 ¾ in. long. We're adjusting pretty well - I'm back at work full-time but when we're home with him, we love watching him grow and learn. He's just started laughing, which is the best sound ever."

College of Agriculture and Life Sciences HomecomingTailgate

September 21, 2013

For more info please visit
http://www.alumni.vt.edu/reunion/cals/

College of Engineering Homecoming Tailgate

October 5, 2013

For more info please visit
http://www.alumni.vt.edu/reunion/coe/index.html

(Continued on page 14)

Outstanding BSE Alumni

Two BSE alumni received alumni awards from the College of Agriculture and Life Sciences (CALS) for their professional achievement, leadership, and service to their home department, the college, and the fields of agriculture and the life sciences. Awards were presented at the CALS annual banquet held in March. Congratulations Doug and Michelle!

Doug Durant (BS '77, MS '79)) was awarded the CALS Outstanding Alumnus Award. This award recognizes alumni who have graduated more than 10 years ago.

Doug is Manager, Product Standards and Global Coordinator of Agricultural Tractors at John Deere. Doug began as a design engineer with John Deere 34 years ago, specializing in design of hydraulic components. For the past 16 years, he has been the worldwide coordinator of strategic standards development activities for the agricultural tractor sector. His engineering activities, involving product research, design, and development, have resulted in six patents and an American Society of Agricultural Engineers AE 50 award for hydraulic brake valve technology innovation. Doug is recognized globally for his efforts and leadership in the standards development process and participates on several national and international committees. In fall 2011, he was appointed to serve on the College of Engineering's International Programs Alumni and Industry Board where he provides support to international internship programs and study abroad programs that provide engineering students with opportunities for international exposure and development of a global business perspective.

Michelle Soupir (MS '03, PhD '08) was awarded the CALS Outstanding Recent Alumna Award. This award recognizes alumni who have graduated in the last 10 years.

As a faculty member in the department of agricultural and biosystems engineering at Iowa State University, Michelle conducts a research and teaching program to improve awareness and understanding of the fate and transport of pathogens, pathogen indicators, nutrients, and contaminants of emerging environmental concern, such as antibiotics and antibiotic-resistant organisms. She has 19 scholarly publications, with an additional 6 under review. Her externally funded projects as the principal investigator total over $1.1 million, and $550,000 as a co-PI. Michelle has mentored 15 graduate students, 17 undergraduate research assistants, 12 undergraduate summer interns, and 4 high school and middle school teachers. Her appointment as a Black and Veatch "Building a World of Difference" Faculty Fellow recognizes the high quality and impact of her research, teaching, and mentoring activities.■

We enjoy hearing your news!
Please take a few moments, fill out the Information Sheet insert,
and send it to us or email bsealumni@vt.edu

(Continued from page 13)

Rachel Wagner (MS '04) has accepted a tenure-track assistant professor position in environmental engineering at St Francis University in Loretto, PA. Dr. Wagner is currently completing work as a post-doctoral associate at Penn State and will begin at St Francis in Fall 2013.

Wes Brown (BS '05) recently married Stephanie Osfolk. Wes and Stephanie are currently living in Chesapeake, VA. Wes is a trauma sales associate for Smith & Nephew, a multinational medical equipment manufacturer.

Kathy DeBusk (BS '07, MS '08) will be receiving her PhD in Biological and Agricultural Engineering from North Carolina State University in July. In August, Kathy begins a tenure-track position as an assistant professor of environmental science for Longwood University in Farmville, VA. Kathy has also established her own stormwater engineering consulting firm, Stormwater Solutions and Services, LLC. Kathy now resides in Blackstone, VA and is engaged to Kyle Gee. An April 2014 wedding is planned.

Kerry Choi (BS '09) is currently living with his wife and new baby, Lilah, in Woodbridge, VA. Kerry is enjoying his job as a water resources engineer with URS in Germantown, MD. He works in the same water resources group with fellow BSE alum, **Whitney Thomas (BS '09)**, and does hydraulics modeling for FEMA. Kerry reports, "I'm very much enjoying life after Virginia Tech."

Sujit Ekka (MS '09) has been awarded a fellowship from the Eisenhower Institute at Gettysburg College and the

(Continued on page 15)

(Continued from page 14)

American Public Works Association to present on urban stormwater management at the International Public Works Conference in Darwin, Australia. The conference will be followed by a study tour of the local Public Works Departments and Melbourne Water, the agency managing Melbourne's water resources.

Dan Laird (BS '09) married Brynn Ishler Laird (CEE '09) in June 2012 and now lives in Annapolis, MD. Dan is a regulatory and compliance engineer with the Water Management Administration of the Maryland Dept. of the Environment in Baltimore, MD. Brynn is a stormwater engineer with Contech Engineered Solutions.

Ben Snyder (BS '09) is now an environmental scientist with Timmons Group in Richmond, VA. Ben works with ecologists, engineers, and designers to conduct stream restoration projects for mitigation bankers.

2010's

Naresh Budhavaram (PhD '10) is working at Celanese as an advanced engineer at Narrows, VA. Naresh and his wife also have a new baby boy, Purvith, born in the summer of 2012.

Katie Keller Ellis (BS '11) was recently hired as the Coastal Training Program Assistant at the North Inlet-Winyah Bay National Estuarine Research Reserve (NERR) in Georgetown, SC. Katie is working on a NERR Science Collaborative-funded project in conjunction with the ACE Basin NERR in Charleston, SC, to create a low impact development manual for coastal South Carolina. This manual is specifically related to stormwater applications (pervious pavement, bioretention, etc.) as opposed to energy or building materials. (http://www.northinlet.sc.edu/LID/)

Rich Allevi (MS '12) accepted a position as a Production Management Engineer at the Cargill salt mine in Ithaca, NY in January 2013.

Shaun Richards (BS '12) has accepted an invitation to join the Peace Corps. As of this summer, Shaun will be serving in Panama as an environmental health extentionist.

Mouna Khili (MS '12) is pursuing a PhD in Tunisia, in collaboration between the National Engineering School

of Sfax (south of Tunisia) and an exporting industry located in her native city Siliana (north of Tunisia). Mouna travels between the two cities to fulfill her work, "Extraction of lycopene from tomato by-products."

Jamey Smith (BS '12) is a design engineer with Wetland Studies and Solutions, Inc. in Gainesville, VA, where he has been working on multiple stream restoration construction plan sets. His work has included site grading, tree impact plans, hydrology calculations, water quality impact assessments, planting plans, supplemental planting plans, pebble counts, and bar samples. He also monitors a Low Impact Development Monitoring System and has created exhibits for site wetland impacts.■

Alumni Spotlight

Charlie Dyson (BS '72) is retired from Deere & Co. Agricultural Division. He worked with Deere Agricultural Products for 35 years, including 30 years as a Territory Aftermarket Manager in the Syracuse, Columbus, and Atlanta branches, and 5 years in a John Deere dealership as Aftermarket Manager. Since retiring, he has been maintaining his family farm and working with Habitat for Humanity. His local (Hanover County, VA) Habitat organization recently had a "Falling for Families" fundraiser in which volunteers did a tandem skydive out of an airplane at 14,000 feet, with sponsorship of friends. Charlie thought about the families of the six Habitat homes he worked on during the past year and others who need a helping hand. So, on April 20, 2013, Charlie jumped out of an airplane 4 days after his 70th birthday!

Link to Skydive Pictures:
http://www.flickr.com/photos/95236099@N08/sets/72157633304124177/
Link to "Charlie Dyson's Page" set up by Habitat for Humanity; tells Charlie's story and the story of the Hanover Habitat organization; donations are still being accepted:
https://www.firstgiving.com/fundraiser/charlie-dyson/falling-for-families

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