

Biological Systems Engineering *Newsletter*

Spring 2016

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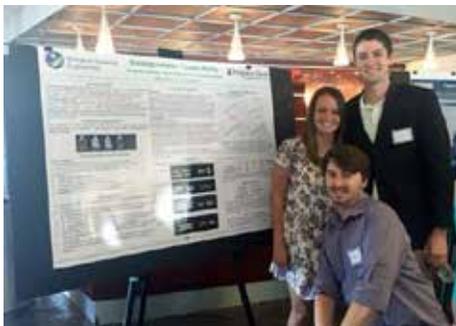
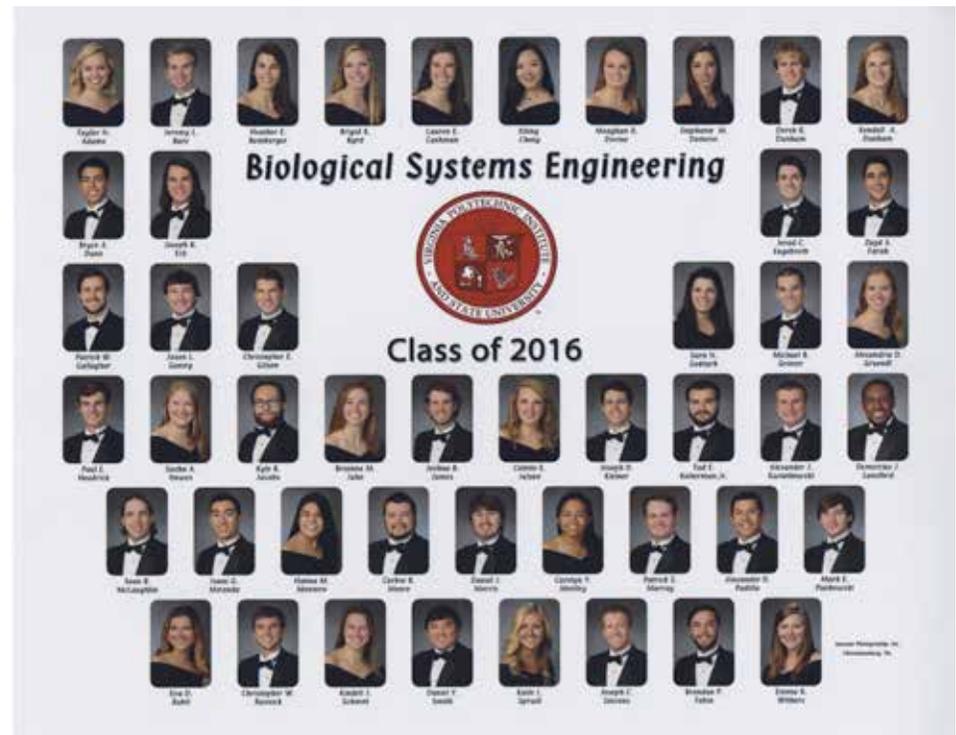
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Congratulations - BSE Class of 2016!



Biodegradable Plastic Bottle Team: Meaghan Devine, Jerad Engebret, and Dan Morris (front)



Left to right: Outstanding BSE students: Lauren Cashman, Rachael Johnson, Samuel Withers, and Nate Jones

BSE Spring Banquet and Senior Design Showcase

On Friday, April 29th, BSE celebrated another year of achievement by our outstanding student body at our Annual Spring Banquet, held this year in the Lane Stadium South End Zone banquet hall. Senior design teams combined posters detailing their final designs with short oral presentations to the faculty, staff, student body, and BSE Advisory Board. Two teams tied for “Best Presentation Award”: the Sol-Ino Personalized UV Awareness System (**Heather Bomberger, Patrick Gallagher, Corbin Moore, Mark Piatkowski**) and Biodegradable Plastic Bottle (**Meaghan Devine, Jerad Engebret, Dan Morris**). Two additional teams won 2nd place for this award: Malawi Peanut Processing Plant (**Brigid Byrd, Patrick Murray, Danielle Rabil, Kindell Schmitt**) and Cedar Run Daylighting Phase I (**Taylor Adams, Collette Julson, Hanna Montoro, Brendan Tobin**).

The banquet also provided an opportunity to recognize notable successes of other members of BSE. Outstanding undergraduate students for each class year, as selected by the BSE faculty, included **Lauren Cashman** (senior) (*You can read more about Lauren on p. 8.*), **Sarah Chaikind** (junior), and **Samuel Withers** (sophomore). Outstanding graduate students included **Nate Jones** (Ph.D.) and **Rachael Johnson** (M.S.). Alpha Epsilon presented BSE associate professor **Ryan Senger** with their “Outstanding Faculty” award (*read more about Ryan Senger’s evolving research program on p. 12*) and BSE financial analyst **Ling Li** with their “Outstanding Staff Member” award.



Mary Leigh Wolfe
Professor and Department Head

Please join us!
VT Alumni & Friends Social
ASABE Annual
International Meeting
Orlando, Florida
Monday, July 18, 2016
8:00 pm

Valued Contributors to BSE (12/1/15 – 5/31/16)

Thank you to all of our alumni, friends, and organizations who generously support the department through gifts and donations! Your contributions help the department enhance the educational experience of our students. You have given us the means to award scholarships to many students and to support graduate student recruitment, student travel to conferences, and student participation in special projects both domestically and internationally. Your contributions also support departmental activities that enhance the educational and work experience of BSE students, staff, and faculty. Please contact the department (barbt@vt.edu, mlwolfe@vt.edu) if your name has been omitted from this list.

Bell, Stephen
Dyson, Charles
Finney, Essex
Flagg, J. Michael & Lisa
Graham, Mark & Katy
Hale, Barbara
Hatcher, Charles
Hepner, Tamsin
Higgins, Jeffrey
Holmes, Brian
Lane, Robert
Perdue, William
Perumpral, John & Shalini

Dear BSE Alumni and Friends,
Greetings from Blacksburg! It is a very exciting, dynamic time at Virginia Tech. Recent changes in university leadership are leading to new vision and priorities. With our focus on water, energy, food, sustainability, and health, BSE will continue to be a significant contributor to Virginia Tech's positive impact through teaching, research, and extension.
We have personnel changes happening in BSE. A key member of the BSE department is retiring July 1. **Barbara Wills** has been assistant to the department head since 2003 when **Saied Mostaghimi**, department head 2003-2009, hired her. I have had the pleasure of working with Barbara for the past 6½ years. We owe her a huge, special thank you for her outstanding, wide-ranging contributions to the department, from personnel to Foundation funds to event planning to website management to newsletter design and layout ... the list goes on and on. She has touched

Pitman, Robert
Powers, David
Prince, Robert
Resop, Jonathan & Shannon
Shepherd's Haven Farm
Smith, Easley
Smith, John
Southeast Rural Community Assistance Project, Inc.
Thompson, Ralph
Trykowski, Tom
Wills, Larry
Yagow, Eugene

the lives of everyone who has passed through the department over the past 13 years. I will miss Barbara, as an outstanding assistant, but even more importantly, as a friend. Best wishes to Barbara for a very happy, fun, and healthy retirement!

I would also like to say a special thank you to the following BSE Advisory Board members who have served throughout my tenure as head and completed their terms on the Board in May: **Clifton Bell** (Brown and Caldwell), **Matthew Dickson** (MedImmune), **Michael Flagg** (Hanover County, BS '86), **Kelly Ramsey** (US-DA-NRCS, BS '98), and **Kevin Tweedy** (Ecosystem Planning & Restoration, BS '95). They have provided invaluable advice with regard to all facets of the department. I was relieved and pleased when they assured me that they will continue to support the department. Thank you!

A new assistant to the department head, **Melody Clark**, will join BSE in mid-June. Melody is moving to our area from New York, where she has been assistant to a school district superintendent. A new faculty member will join BSE in August. Assistant professor **Julie Shortridge** will have research and extension responsibilities in water resources. Welcome to Melody and Julie!

The department's Biodesign and Bioprocessing Research Center (BBRC) continues to develop. The BBRC is offering a workshop, Multi-Scale Metabolic Modeling and Engineering, on August 3 in Arlington, VA. **Justin Barone**, BSE associate professor, has secured support from the National Science Foundation to subsidize participants' costs. Please contact Justin (jbarone@vt.edu; 540-231-0680) for more information; register at <http://www.cpe.vt.edu/reg/mmmew/index.html>.

Please come by BSE for a visit and tour any time. Best wishes for a great summer and fall!

Go BSE! Go Hokies!

Mary Leigh Wolfe

Senior Design Partnerships

The BSE comprehensive design course for seniors is a two-semester long, real-world team design experience. In 2015-16 we had 49 seniors in 14 teams that developed designs focused in biomolecular engineering (BE) and watershed science and engineering (WSE), as well as food, bioprocessing, and health-related engineering.

Ten design projects were developed with and for industry clients, three were related to faculty-derived ideas, and one was fully developed by the student team. The actual end-point locations of the designs were local (on campus and in town), regional (City of Roanoke and Salem), eastern Virginia (Saluda), and international (Malawi). For the first time we had two teams working on the same design problem (for Novozymes in Salem, VA) and, given that we have 70 seniors in the 2016-17 class, we will be moving toward having more teams developing alternative designs for the same client endpoint. Designs were developed for nonprofit groups (Lick Run Farm and Community Development Center, Lick Run Watershed Association, and Impact+Amplify), for-profit groups or companies (Afri-Nut Ltd., Cardinal Mechatronics, Cell Free Bioinnovations, and Novozymes), government agencies (City of Roanoke, Virginia Department of Corrections, and Virginia Tech Dining Services), and a local apartment complex (Foxridge Apartments).

Students benefit greatly from working on actual design problems identified by members of industry or engineering consulting firms. If you have ideas for a design project that you would like to submit, please develop a brief description of the proposed project and send to BSE professor **Cully Hession** (chession@vt.edu).

Vist us at:
<http://www.bse.vt.edu/>

New Senior Design Workroom

Using funds from the College of Engineering laboratory fees, we were able to refurbish 115b Seitz into a multi-purpose work room for senior design teams. This room provides space for storage of team tools and prototypes, several tables for group meetings, and wet-lab space. In addition, we have added a map cabinet for storage of design plans (CAD, SuperPro Designer etc.) and a computer/TV for conducting group conference calls with external mentors. See our before and after pictures below.





ASABE Student Branch News

This year VT BSE was so excited to host the ASABE Southeastern Regional Rally. **Sara Gokturk** (SE ASABE President), **Hanna Montoro** (SE ASABE Treasurer), and their Rally planning team spent an entire year planning, fundraising, and preparing to host the conference. Over 130 students from 14 schools in the region were in attendance. Rally would not have been possible without all of the help from the BSE Department, professors, students, sponsors, and our local ASABE chapter volunteers!

Visiting students arrived on Friday April 1st and kicked off their stay in Blacksburg with a tour of HABB1. BSE and Food Science professors in the building gave visiting students tours of their lab facilities as well as demonstrations. Students then competed in a design competition where they built bridges using gum drops and tooth picks. Students also listened to the current ASABE president and BSE department head **Mary Leigh Wolfe** speak about “ASABE Members Working Together to Make a Difference.” Friday activities concluded with an ASABE Quiz Bowl where students answered ASABE, engineering, and VT related questions.

Saturday festivities began with a talk from **Susan Sumner**, CALS associate dean, and then a presentation from the VT Office of Sustainability. Students then went on lab tours in Seitz, ICTAS II, and StREAM Lab. Students toured the sediment lab, saw the rainfall simulator, and the flume. Students were shuttled to StREAM Lab field sites to talk with BSE professor **Cully Hession** and his students about the current research going on there. Students were also given the opportunity to learn about BSE Extension from presentations by BSE professor **Brian Benham** and extension associate **Erin Ling**. During lunch, students heard from BSE Outstanding Alumnus **Brad Douglas** about making the most of what you know, and heard about graduate school possibilities in BSE from Dr. Wolfe. Students were then given the opportunity to mingle and talk to current BSE graduate students during a research poster session. Saturday evening concluded with the annual business meeting, election of new officers, and a presentation from the keynote speaker, ASABE Past President, Dr. Terry Howell, along with recreational time at BreakZone in Squires Student Center where students could get to know each other over ping pong, bowling, and billiards.

The spring semester has been a busy one for our local ASABE chapter beyond Rally planning! We started off the semester with a “Pancake Etiquette Dinner”, where students learned how to conduct themselves at a formal business meal over pancakes! This semester we also hosted several guest speakers including Dr. Alex White from VT Dairy Sciences who spoke about managing finances after college; Erin Ling who gave a presentation on the Virginia Household Water Quality Program (VAHWQP); and Brian Benham’s team of students from “Service Without Borders” who gave a presentation about their efforts and trip to Nepal. Our students also helped out at Habitat for Humanity in Roanoke.

Finally, new ASABE Officers for the 2016-2017 school year were elected. They are as follows: President: **Taylor Lohneis**; Vice President: **Austin Gouldin**; Treasurer: **Jessica Slagle**; Secretary: **Alison Waldman**; and Parliamentarian: **Suraye Solis**.

- **Sara Gokturk**, ASABE President 2014-2016

Alpha Epsilon (BSE Honor Society)

The Virginia Tech Eta chapter of Alpha Epsilon has been keeping busy with many activities this semester. AE teamed with the Graduate Student Organization (GSO) to host a preliminary exam discussion over afternoon snacks. For this event, BSE students who have completed their preliminary exams were invited to share their experience and explain how the written and oral components of the exam are conducted.

AE members continued the maintenance of the Julia Pryde Memorial Garden by planting additional perennial shrubs and annual flowers, and generally tidying up the beds. To prevent the garden from collecting cigarette butts, AE worked with facilities to have an outdoor ashtray placed in the quad in front of Seitz to provide smokers an appropriate location for their trash.

This year we inducted twenty new members to our society at the BSE department banquet on April 29th (pictured above). We also provided a warm welcome to our 2016-2017 Officers: **Pedro Ivo Guimarães** as President; **Frank Gillam** as Vice-President; **Sam-path Karunarathne** as Treasurer; and **Tyler Keys** as Secretary.

- **Imen Tanniche**, AE President, 2015–2016



Graduate Student Organization (GSO)

The Graduate Student Organization (GSO) hosted several community-building events this semester, in partnership with honor society Alpha Epsilon, including graduate student coffee hour and a preliminary exam info session. Additionally, GSO invited all graduate students to participate in an open forum to discuss their experience in the department and determine what's working for us, what we'd like to see more of, and where improvements can be made. The event was a success with over a third of the BSE graduate students in attendance and strong representation of both the watershed science and engineering and biomolecular concentrations. The GSO officers are fulfilling their role facilitating interaction between faculty and students, and met with BSE department head **Mary Leigh Wolfe** and **Mike Zhang**, BSE graduate program director, to summarize the findings of the forum and identifying opportunities to strengthen the department and enhance graduate life. We are excited for this work to continue as we elect next year's officers, who will undoubtedly serve the department and graduate student body well.

- **Emily Bock**, GSO President 2015-2016

Congratulations to three BSE graduate students who completed their degrees

MS Degrees Completed Fall 2015



James (Martin) Davis (Advisor: **Z. Easton**), *Biochar and pH as Drivers of Greenhouse Gas Production in Denitrification Systems*. Martin is currently seeking a full-time position in the Hampton Roads, VA area.



David Roth (Advisor: **J. Barone**), *Genetic Engineering of Functional Large Amyloid Fibers*. In January, David started his new job as the entrepreneurial lead of a National Science Foundation (NSF) Innovation Corps (I-Corps) team. The objective of the I-Corps program is to assess the market opportunity for previous research funded by the NSF. After the "lead startup" curriculum of the program concluded in February, David has continued the process of starting a technology company.

James Wade (Advisor: **Z. Easton**), *Biotic and Abiotic Remediation of Acetaminophen with Woodchip and Biochar-amended Woodchip Adsorbents*. James is currently employed at Straughan Environmental located in Columbia, Maryland. His daily duties include drafting, spreadsheet creation, and meeting state and local regulatory criteria for stormwater and erosion and sediment control aspects of land development projects. He routinely bicycles to work along a floodplain pedestrian path and can easily visualize and appreciate how his company's designs impact everyday life.



Education Abroad

Some of our BSE undergraduates design a truly global engineering education by spending a semester or more studying abroad. Here a few of our international scholars reflect on studying and living in another country:



Evan at Cliffs of Moher

Evan Frazier – at UCD in Dublin, Ireland

“I am currently studying abroad at University College Dublin for the spring semester. I am fortunately enrolled in courses that cover a wide range of topics which all relate to BSE. I am taking courses ranging from food processing and chemical transport to air pollution and pharmacokinetics. Highlights of my trip thus far include traveling to Prague and Barcelona and joining the college lacrosse team and traveling around Ireland to play different teams on the weekend!”

Kd Greenleaf – at UCD in Dublin, Ireland

“Most of the classes alternate weeks, or only meet a few times in the semester so I have a hard time remembering which classes to go to! Also there is much less homework, and our final exams account for the bulk of our grade (60-80%) so it’s a bit nerve racking. The grading scale is much different; I believe to get an A you have to get somewhere around a 73. My organic chemistry class requires a lab, and it’s my first lab not having a lab partner so that’s been really good experience working alone in a lab. And I also really like how my O-chem professor is also the lab instructor so he gets to know us pretty well. I’ve been having a great time and the people here are absolutely lovely!”

Samuel Elizondo Villareal – at the Institute of Technology Monterrey in Mexico

“My experience is inherently different than most Tech students since I was originally studying abroad as a VT student and I am now back home for a semester in Mexico. Nevertheless, my time in Monterrey, Mexico has been nothing short of extraordinary. I love the food, the mountains, and my friends and family. I’ve also had a chance to travel around Mexico and enjoy its beautiful sights.”



Kd hiking in Ireland



Samuel visiting the world’s biggest salt factory in Monterrey

BSE Scholarships

Through the generous donations of alumni and friends, the BSE Department has 13 endowed student scholarships. At this year’s BSE Spring Banquet, the department awarded scholarships to 50 undergraduate students for the following academic year. Scholarships are awarded based on need and/or merit, depending on the specifications of the endowment.



New Addition – Congratulations!

It was the evening of Black Friday when BSE graduate student **Sravanthi Budaraju** was admitted to the hospital. After 16 hours of labor, she and her husband Raghu welcomed their baby girl. She was born on November 29, 2015 at 3:22 am. They named her Sri Deetya following their cultural beliefs. She is growing up fast, keeping them busy all the time and making every day special.



Gallagher's Solar-powered Outdoor Study Table

BSE senior **Patrick Gallagher** recently made the news for his innovative design of a solar-powered outdoor study table. Patrick, president of the group Students for Clean Energy, wanted to provide students with an outdoor space to meet and work where they could charge their various electronic devices via renewable energy. Patrick says of his design, "The solar table embodies my personal mission to promote renewable energy and sustainability as a Biological Systems Engineer. My hope is that the table...will inspire other scientists and engineers to pursue renewable energy and environmental conservation. Solar panels are often hidden from sight, so this solar table creates a unique opportunity for students to directly experience how incredible solar energy can be. The more students use the table to charge their devices, the more they will consider renewable options as consumers and future homeowners. The table will also serve as an educational platform for the Students for Clean Energy, the campus organization through which I submitted the proposal. Whether studying watersheds, food and drug processing, or renewable energy, together we can Invent the Green Future!" A working table prototype was constructed with funds Patrick obtained from the Virginia Tech Office of Sustainability and installed on Earth Day 2016.



Senior Placement

Our 2016 graduating seniors are putting their BSE knowledge to work and inventing the future in numerous positions throughout the world! Examples include:

Position	Organization	Location
Supply Chain Operations Associate	Frito Lay	Lynchburg, VA
Water Resources Engineer	ARCADIS	Washington, DC
Engineer	RK&K Design	Virginia Beach, VA
Chemical Corps	US Army	Oahu, HI
Staff	Blue Ridge Fellows	Roanoke, VA
Environmental Engineer	ERG	Chantilly, VA
Supply Chain Operation Associate	Gatorade	Wytheville, VA
Systems Engineer	Patricio Enterprises	Quantico, VA
Business Technology Consultant	Deloitte	Washington, DC
Volunteer	Peace Corps	Guinea, Africa
Junior Engineer	Dennis Group	Atlanta, GA
Program Coordinator	Saha Global	Ghana, Africa
Consultant Engineer	FM Global	Reston, VA
Engineer	General Dynamics Electric Boat	Groton, CT
Environmental Engineer	Timmons Group	Richmond, VA

And some of our graduates are choosing to continue their academic studies in various graduate and professional programs:

Program	University	Location
Biomedical Engineering	University of Minnesota	Minneapolis, MN
Biosystems Engineering	University of Kentucky	Lexington, KY
Biomedical Engineering	Virginia Tech	Blacksburg, VA
Mechanical Engineering	Virginia Tech	Blacksburg, VA
Biological Systems Engineering	Virginia Tech	Blacksburg, VA

New Graduate Student - Spring 2016

PhD Student

Katherine Bland (Advisor: Xueyang Feng)
BS Biological Sciences, Bowling Green State University,
2015



Left to right: Sean Mackey, Sydni Koch, Suri Solis, Jugroop Singh, Sasha Howes, and Samuel Withers (12 additional Ambassadors not pictured.)



Cashman attends Meeting of the Minds Conference

BSE Outstanding Senior **Lauren Cashman** and five other undergraduate researchers were selected to represent Virginia Tech in the ACC Meeting of the Minds conference, held this year at Syracuse University. Each of the 15 ACC schools sent between six and nine students to participate in a highly interdisciplinary meeting of researchers and artists. Lauren presented her undergraduate research, which was conducted with the Pediatric Medical Device Institute. Titled “Distributed Thermistors for Temperature Monitoring of Malnourished Infants,” this effort details the design and development of a system to wirelessly monitor the temperatures of infants in low-resource hospitals to detect the onset of hypothermia. Lauren will take her system to hospitals in Southern Malawi this May to demonstrate it and receive feedback from healthcare professionals there. The Meeting of the Minds was particularly valuable to Lauren because it offered the chance to share her research with students from widely varied fields who could provide unique insights to her work. Lauren says of the conference, “It was a wonderful experience largely due to the huge variety of disciplines represented. People working in international relations could speak to my work in ways engineering students usually can’t, and I saw some incredible research in literature, architecture, and music, in addition to inspiring work in the STEM fields. I’m very grateful to have been selected, as well as for the things I learned and friendships I made.”

BSE Ambassadors

The 2015-2016 BSE Ambassadors represented the department at numerous recruiting events this year including the COE Information Session, the Student Engineers’ Council’s Mixer, the BSE Open House, Hokie Preview, Hokie Focus, and the COE Open House. They also had the unique opportunity to participate in and help run the Southeastern Regional ASABE Rally hosted here in Blacksburg. In addition, the Ambassadors gave presentations at multiple local high schools and their own alma maters and produced videos of professors’ research.

**Thinking about
grad school...**

Or know of someone who is?

**BSE is accepting
applications**

**Applications due date for
Spring 2017: Sept. 15, 2016**

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

More International Experiences

This was an exciting and busy year for BSE students traveling internationally. We had 13 students who have or will take part in international research, internships, education, or service projects that were funded by the Pratt or Julia K Pryde Funds.

Six BSE students, (**Chris Gilson, Serena Emanuel, Haley Kujawa, Bianca Pinto, Suraye Solis, Jordan Wetzig**) will be participating in internships with Huadong Engineering Company in Hangzhou, China this summer. **Youtong Fu (BSE PhD '94)** is sponsoring the internships through his company Triad Engineering Applications, Inc. (*more on Youtong on p. 14*). Our students will be immersed in the growing water resources engineering related issues in rapidly developing China.

Two students (**Haley Kujawa, Jason Wilkinson**) participated in the Saha Global Program this past December. Saha Global is an international leadership program that includes engineering principles required to create and install clean water systems, as well as the critical experiences of cross-cultural collaboration. Jason and Haley focused on developing, imple-

menting, and installing a water sanitation system and business in a village in Ghana.

Danielle Rabil participated in the Pamplin Study Abroad Program: Peru and Ecuador: Business, Culture, and Leadership program this winter. This program provides students with in-depth cultural immersion, business skills, and leadership training.

Elizabeth Merin was accepted into the VT Presidential Global Scholars Program where she spent spring semester researching cheese production in Riva San Vitale Switzerland.

Jenna O'Brien spent the spring semester in an Exchange Program at the University of Oviedo in Oviedo where she was immersed in Spanish culture and conducted all of her course work in Spanish.

Rachel Molloy will participate in the WASH Program in Malawi this summer. The WASH program (Water, Sanitation, and Hygiene) is a VT program run by Ralph Hall, assistant professor in Urban Affairs and Planning, where students study water, sanitation, and hygiene issues. Students will study the design of relevant technologies from the perspective of pub-

lic health, cultural appropriateness, and sustainability, and then undertake community-based fieldwork.

Lauren Cashman will be traveling to Malawi this summer to participate in a medical device delivery project with the lab group with which she conducted her undergraduate research, Pediatric Medical Device Institute (PMDI). PMDI is associated with both the VT Carilion School of Medicine (VTSOM) and the VT Department of Mechanical Engineering. Their summer program builds on an existing collaborative program between Virginia Tech and Radford University called Teaching and Learning in Malawi. PMDI is sending a medical team with the education students to bring the devices created in their lab to hospitals in Malawi.

Top left: Jason Wilkinson and team members with the chief of K. Paliguna, the village where they installed a water treatment center; bottom left: Lizzy Merin with the Reggiana's Breed of Red Cow, which was once endangered but now, thanks to the Consortium of the Red Cow, produces the best milk used in Parmesan cheese; and right: Jenna O'Brien jumping at Covadonga, Asturias, Spain.



Turner Fellows of Engineering

BSE associate professor **Theresa (Tess) Thompson** and BSE professor **Chenming (Mike) Zhang** were appointed Turner Fellows of Engineering, effective April 10, 2016. James E. Turner Jr. and his wife Elizabeth created this endowment which enabled the College of Engineering to support four outstanding faculty members (two in BSE) with fellowships.

James E. Turner Jr. (BS '56) has had a successful and respected career in specialty engineering and an extensive volunteer career with the university, including service as Rector of the VT Board of Visitors, and a member of the VT Foundation Board of Directors and executive committee, the Academy of Engineering Excellence, the College of Engineering's Committee of 100, the College of Engineering Advisory Board, Hokies for Higher Education, and the campaign steering committee for Virginia Tech's past comprehensive campaign.



Thompson and Zhang were nominated based on the recommendations of the BSE Advisory Board. They both have excelled in research, teaching, and service at Virginia Tech. Thompson has developed a leading research and teaching program in ecological engineering with a focus on stream and wetland systems. She has strong external funding and publication records and has given several keynote invited presentations on her work at national and international conferences. She is an excellent, dedicated teacher, bringing her work experience and research to the classroom as she emphasizes “real world” problems and hands-on experiences. As assistant department head for undergraduate studies, she oversees all aspects of the educational program and has done an excellent job leading the program in adapting to the nearly tripling of our enrollment while maintaining strong learning outcomes for the students.



Zhang's research program focuses on development of safe and effective vaccines or therapeutics to combat existing and emerging human and livestock diseases. His scholarly record is outstanding and he has obtained significant funding from federal agencies, including the National Institutes of Health and U.S. Department of Agriculture, and from industry. His work was recognized in 2015 with a College of Engineering Dean's Award for Research Excellence. Zhang is an excellent teacher and has also led continuous curriculum improvement efforts. Through his leadership as graduate program director, he has contributed significantly to increasing the number of graduate students in the BSE program. Zhang is a leader in the American Society of Agricultural and Biological Engineers (ASABE), having completed the officer progression for the Biological Engineering Division of ASABE.

Congratulations Tess and Mike!

Zhang awarded COE Dean's Research Award

BSE professor **Y. H. Percival Zhang** was one of five VT faculty members awarded the COE Dean's Award for Research Excellence for 2016. Over the past two years, Zhang's work has focused on sugar batteries and production of hydrogen from biomass sugars. His invention of a high-energy-density sugar-powered, metal-free, biobattery to power portable electronics was published in *Nature Communications* and garnered acknowledgements from high profile news media such as *Time* magazine. In his research, Zhang also achieved the highest yield hydrogen production from biomass sugars and was awarded an approximately \$1 million U. S. Department of Energy grant to continue this work. In his spare time, Zhang founded two start-up companies to facilitate commercialization of his inventions.

Congratulations Percival!

(Right) COE Dean Richard Benson presents award to Y. H. Percival Zhang.



In Memoriam - CJ Mitchem

Charles (CJ) Mitchem passed away unexpectedly on January 17, 2016. CJ had been working in our department as a watershed assessment analyst and project manager in BSE professor Brian Benham's group since 2014. He had also been instrumental in assisting BSE professor Cully Hession in teaching, advising, and assessing our senior design class.



A proud graduate of Virginia Tech, CJ received B.S. and M.S. degrees in our department in 1994 and 2000, respectively.

He worked for many years at Stearns & Wheeler and Engineering Concepts as an environmental engineer. Throughout his career, CJ stayed connected with our department, providing senior design projects and mentoring student design teams. For the last several years, CJ served as a technical consultant for the Central Shenandoah Planning District Commission, as well as working in the BSE department. He also leaves a significant technical legacy in several environmental practice areas, having co-authored a number of technical and guidance documents.

CJ will be missed greatly by all students, staff, and faculty in BSE, as both a person and a professional.

BSE is on Facebook!

Virginia Tech Biological Systems
Engineering

<http://facebook.com/vtbse>

VT BSE Alumni

<https://www.facebook.com/groups/vtbsealumni/>

Lake joins BSE

Jack Lake joined BSE assistant professor **Warren Ruder's** research group in March 2016 as an engineering research technician. Prior to joining the group, Jack worked for almost four years as a strategy consultant for a life sciences consulting firm in Boston, Massachusetts. Jack holds a B.S. in Mechanical Engineering from Columbia University and a B.A. from Bowdoin College in Chemical Physics. He is excited to return to engineering research in an academic lab setting, where he will conduct research focused on engineering communication interfaces between genetically engineered cells and robotic systems.



New Grants

Inventing the Future of Biological Materials

BSE associate professor **Justin Barone** recently received a USDA-NIFA grant to develop a new biobased material that could displace some of the fossil fuel based materials currently used in plastics. Most plastics derive useful properties from being mixed with non-plastic "fillers" that add value to the plastic. The research will focus on using an agricultural by-product, wheat gluten, to derive a protein filler that when mixed with fossil fuel derived rubber will increase the biobased content of plastic, making it more environmentally-friendly. The performance of the new protein/rubber nanocomposites will be assessed to determine the suitability of the material for commercial use. The filler is projected to compete – in terms of performance and price – with current nanofillers used by the plastics industry. The wheat gluten would have a new high value use and not be disposed, thus providing value to the farmer. Plastic producers could also obtain benefits by decreasing their dependency on finite fossil fuel supplies and the associated price volatility.



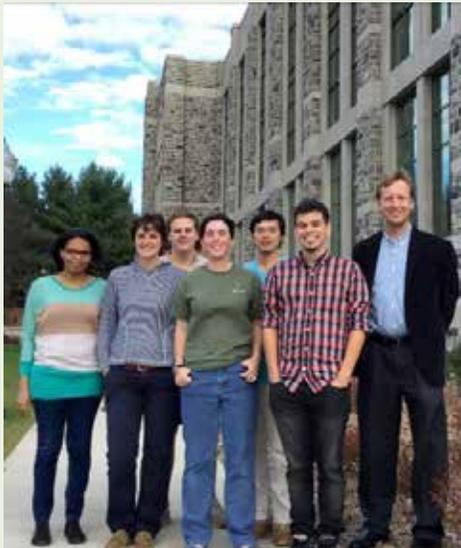
Implementing Runoff Advisory Tools for Current and Short-Term Forecasting

Despite decades of efforts to reduce non-point source nutrient pollution, excess nutrient delivery continues to persist, particularly from poorly managed agricultural land, which has long been implicated as a significant contributor to water quality impairment. Producers and conservation personnel, therefore, need easy to use, real-time tools to help them identify when and where a runoff event may occur, particularly in areas with recent nutrient application. BSE assistant professor and extension specialist **Zach Easton** is leading a project that will draw on the strengths of four different current runoff advisory tools to develop, validate, and implement an innovative advisory system and suite of supporting materials that can be implemented in any applicable area in the US. This runoff advisory system will aid in preventing excessive nutrient losses by providing producers and conservation personnel with current and short-term forecast information about when and where a parcel of land is subject to high runoff risk and thus nutrient loss. Producers and conservation personnel can then use this information to change nutrient management strategies and avoid unintended impacts to water quality. The project is funded by the USDA and includes collaborators from USDA-ARS and the Whatcom Conservation District.



Research Spotlight: Senger Lab Group

Since starting at Virginia Tech in 2009, the Senger Lab, led by **Ryan Senger**, BSE associate professor, has focused traditionally on Metabolic Engineering and Systems Biology of microbes. In particular, they have sought ways to genetically engineer bacteria to convert renewable resources (e.g., cellulose, CO₂) into valuable chemicals and biofuels. While seeking better conversions, the lab developed core technologies that have led into new phases of research. For example, while seeking better conversions of plant cellulose, the Senger Lab developed a new technique for generating and screening “genomic libraries.” Here, DNA was harvested from all of the microbes in a soil sample (DNA was found from thousands of organisms covering 72 phyla!). The DNA was packaged and screened for genes that could more rapidly degrade cellulose. These genes were then installed in ethanol producing microbes. The result was a bacterial strain that converted plant cellulose into higher levels of ethanol quickly. This same genomic library technology is now being used to remediate fungal toxins that contaminate spent grains from commercial ethanol fermentation that are to be used as animal feed. The genomic library technology has been used to identify single genes that exist in the environment that are capable of reducing fungal toxins in spent grains by 90%, and additional improvements are expected.



L-R Imen Tanniche (BSE graduate student), Nina Wilson (PPWS graduate student — co-advised by Senger), Jackson Toth (BSE Undergraduate), Amanda Fisher (GBCB graduate student — co-advised by Senger), Jiun Yen (BSE graduate student), Pedro Ivo Guimaraes (BSE graduate student), Ryan Senger

Not pictured: Bill Carswell (BSE graduate student), Derek Dunham (BSE undergraduate), Diego De La Torre (BSE undergraduate)

The Senger Lab has also expanded into the field of biomedical engineering research. This also happened as a result of early research to engineer microbes to produce ethanol from cellulose. In addition to the genomic libraries approach, the Senger Lab constructed mathematical network models of metabolism in an effort to identify genes for genetic engineering. As genes of bacteria were manipulated, the size, shape, and chemical composition of the bacteria cells changed as well. Ultimately, the Senger Lab learned to control this and responded by working with Glenda Gilaspy (professor and head, Dept. of Biochemistry) to engineer plants that were larger and contained more cellulose. They also developed means of determining the size, shape, and chemical composition of individual cells quickly and inexpensively. When John Robertson (professor, Dept. of Biomedical Engineering and Mechanics) learned of the methodology, he asked, “Why are you not using this technology to save lives?” The Senger Lab collaborated with Robertson to show that the methodology could be used to monitor the chemical composition of urine to determine overall kidney health and detect urinary tract cancers. Senger and Robertson founded DiallySensors, Inc. to commercialize the technology they now call “R-omics.” In a few short years, R-omics will be used to identify new patients in early stages of kidney disease (before symptoms present) and/or urinary tract distress. R-omics will also be used to monitor patients receiving dialysis treatment so doctors can better understand the progression of the disease and if current treatment is showing benefit.

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SERCAP and BSE partner to educate high school students and families about well water safety

Southeast Rural Community Assistance Project (SERCAP) is a long-time partner of the Virginia Household Water Quality Program (VAHWQP) in the BSE department. SERCAP generously provided funding recently for VAHWQP to pilot test a youth component of their program. VAHWQP provides affordable and confidential well and spring water testing to the 1 in 5 Virginians who rely on these systems. Working with several teachers affiliated with the Carroll County High School Agriculture STEM lab, VAHWQP’s typical well and spring water testing clinics were adapted for a youth audience, and the high school participants became the educators for their families. High schoolers collected samples from their own household taps and then visited the VT campus where they learned how the samples are processed through the BSE Water Quality lab, participated in hands-on activities, and heard presentations from VAHWQP faculty and lab staff, BSE graduate students, local well drilling contractors, and a food safety specialist in the Food Science and Technology department. A few weeks later, **Erin Ling**, VAHWQP coordinator, visited the high school to give a presentation about the group’s water quality results as a whole.



Asa Spiller, BSE Water Quality Lab Assistant, explains use of the pH meter and conductivity probes to visiting students.

VT researchers discover a royal flush in powering fuel cells with wastewater

(*VT News February 23, 2016*) As renewable energy sources go, solar rays have historically hogged the limelight. But two Virginia Tech researchers have stolen the spotlight from the sun by discovering a way to maximize the amount of electricity that can be generated from the wastewater we flush down the toilet.

BSE assistant professor **Xueyang Feng** and Environmental Engineering associate professor Jason He traced bacteria, which led them to discover that the working relationship between two specific substrates produced more energy than either did separately. This work will help take the mystery out of how electrochemically-active bacteria create energy. It could help in the development of a new treatment system called a microbial fuel cell.



Read more and watch a video at: <https://www.vtnews.vt.edu/articles/2016/02/022316-cals-wastetopower.html>

Welcome Visiting Scholars!

Weihua Qiu is currently a visiting scholar within BSE working on various enzyme engineering projects with BSE professor **Percival Zhang**. She completed her Ph.D. in 2008 in Biochemical Engineering from the Institute of Hongzhang Chen, and is now an associate professor at this same university. Qiu's research focus is the bioconversion of lignocellulose, especially the biodegradation of lignocellulose through the catalysis of enzymes such as laccase, cellulase, horseradish peroxidase; she has published more than twenty peer reviewed journal articles and several book chapters. She has been honored with several awards including the Beijing Science and Technology Award (second prize, 2012), the National Energy Administration Science and Technology Progress Award (third prize, 2011), and the National Light Industry Council Science and Technology Award (second prize, 2010).



Elaheh Motevali Bashi Naeni is a visiting scholar in BSE from Shahid Chamran University of Ahwaz, Iran working with BSE assistant professor **Venkat Sridhar**. Her research, which will comprise part of her Ph.D. thesis, focuses on drought analysis under climate change in the Zayandeh Roud Basin, one of the most complicated watersheds in Iran. Elaheh completed her MSc in Water Management from Isfahan University of Technology and BSc in Civil Engineering from Amirkabir University of Technology in Tehran, Iran. She has worked as a lecturer in Payame Noor University and Azad University of Khorasgan. Her past experience also includes working as a research engineer in the Integrated Water Resources Management (IWRM) of Zayandeh Roud River Project for the Isfahan Regional Water Board (with cooperation of German Ministry of Science) between 2012 and 2013. She hopes to complete her current research and Ph.D. in the next year and continue to contribute to her city in the water management sector.

Supraja Hariharan is an exchange scholar from India, currently doing her Bachelor's degree in Civil Engineering at Sastra University in Tamil Nadu. She is here at Virginia Tech for a span of three months, to undertake research work in hydrological modeling under the direction of BSE assistant professor **Venkat Sridhar**. The main objective of her research is to implement the SWAT model for a few basins in the United States, and extend that experience to certain basins in India. So far, Supraja found her experience at VT to be very rewarding. She is planning to take up her Master's degree upon completion of this project. She believes her work at VT will be one of great significance in whatever she plans to do with her career in the upcoming years.



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 to Brad and Janette!

Brad Douglas (BS '83) was awarded the CALs Outstanding BSE Alumnus award. This award recognizes alumni who have graduated more than 10 years ago. Douglas is the vice president of engineering for the American Wood Council, the voice of North American wood products manufacturing, which represents over 75 percent of an industry that employs over 400,000 men and women in the United States. With more than 32 years of experience in the wood products industry, he directs a program aimed at developing state-of-the-art engineering data, technology, and standards on structural wood products, systems and assemblies for use by design professionals and building officials that assure safe and efficient wood-based designs. He serves on several standards development committees of organizations, including ASTM, American Society of Civil Engineers, U.S. Federal Emergency Management Agency's Building Seismic Safety Council, and the International Code Council, addressing proper design of wood buildings to resist high wind and seismic loads. Douglas was the 2015 recipient of the Award of Merit and title of fellow from ASTM International Committee D07 on Wood, which is the highest organizational recognition for individual contributions to standards activities.

Janette (Peters) Wolf (BS '06) was awarded the CALs Outstanding Recent BSE Alumna award. This award recognizes alumni who have graduated in the last 10 years. Wolf is a Project Manager for Civil and Environmental Consultants (CEC), Inc. CEC provides innovative design solutions and integrated expertise in the primary practice areas of civil engineering, ecological sciences, environmental engineering and sciences, waste management, and water resources. She has served in an executive officer role for the Soil and Water Conservation Society Tennessee Chapter and is an instructor for the Tennessee Erosion Prevention and Sediment Control Training Program for Construction Sites. Wolf coordinated a volunteer event for tree plantings at the Land Trust for Tennessee's Glen Leven Farm and at Monroe Harding Academy and participated in the Cumberland River Compact's 50K Tree Day, a statewide effort to plant 50,000 trees in one day. She is currently serving on the BSE Advisory Board for the first time.



Alumni Spotlight

Youtong Fu (PhD '94) will be mentoring six VT-BSE students in 10-week internships in Hangzhou, China this summer at the Huadong Corporation. The students will have hands-on training in water resources engineering, storm management, nonpoint pollution, and environmental monitoring in addition to an immersive cultural experience working abroad.

Fu is currently CEO of Triad Engineering Applications, Inc. based in Reston, VA, with additional offices in Washington DC and at several locations in China. Triad Engineering Applications, Inc. is an international firm that provides consulting, engineering, and technical services, in a range of areas, including environmental services, management and international consulting, renewable energy, chemical engineering, technical and management training, and information technology. The company has a history of partnering with Fortune 500 companies for large public infrastructure projects such as the Three Gorges Dam, the Chinese Youth Olympics in Nanjing, and Big Data for Chinese utilities.

Fu received an undergraduate degree in Geo and Ocean Sciences at Nanjing University. While in China, he read an article published by BSE professor Vernon Shanholtz and decided to apply to VT's BSE graduate program. Fu was accepted and went on to earn his Ph.D. at VT. During his degree, he worked with Shanholtz on the VIRGIS project, a state-level water quality monitoring program that included watershed mapping and management using GIS and remote sensing technologies to control nonpoint source pollution to the Chesapeake Bay. Fu has fond memories of working long hours during his assistantship with Shanholtz, Saied Mostaghimi, and other BSE faculty members on nonpoint source projects. After graduation from VT, Fu worked with different consulting companies on projects including TMDLs, system integration with water quality sensors, and environmental emergency response. His interests in this area have further developed as he works at Triad, where he is developing a big data approach for hydrologic and water quality modeling.

Fu's advice to current BSE students is to work hard, never stop learning, be patient, and keep an open mind.

Alumni Updates

1980s

Jeffrey Gentry (BS '84) serves as President of EGS & Associates, Inc., a consulting engineering and land surveying firm located in Staunton, Virginia. He resides in Fishersville, Virginia with his wife Susan and children, Jason and Ashley, both of whom attend Virginia Tech. Jason graduated from BSE this spring and Ashley is majoring in microbiology. Jeffrey enjoys spending time with family and friends camping, boating, and traveling. He also is the 5th generation in his family to operate a Black Angus beef farm located in Albemarle County just south of Charlottesville, Virginia.

2000's

Adam Faulkner (BS '02) has been busy post BSE graduation. Licensed as a PE in North Carolina and Georgia, he currently works for H&H Resources as a senior engineer in Blairsville, Georgia. After work, he enjoys time with his three kids (Adronell Virginia - 1.5 years, Ander - 7 years, Arbor - 5 years) and wife of nine years, Casey. Life is likely to get more busy and fun in June as they await the birth of their fourth child!



2010's

Jonathan Resop (PhD, '10) and **Shannon Ethier Resop (BS, '10)** are thrilled to announce the birth of their first daughter, Tara Elizabeth, on March 13th. Jonathan is currently a lecturer in the Geographical Studies Department at the University of Maryland and Shannon is an engineer at DSM Nutritional Products. The family is doing well and excited to be raising a baby Hokie.



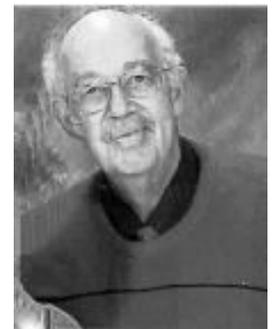
*Right:
Javier training
his team in Bahir
Dar, Ethiopia*



Javier Osorio (PhD '12) was named "Scientist of the Year" by USDA for his work as a research scientist at Texas A&M. Javier generally works to apply the EPIC, APEX, and SWAT hydrological models to numerous diverse global locations including Maui, Hawaii, the City of Austin, Texas, and the Arroyo Colorado Watershed in the United States, as well as Ethiopia, Ghana and Tanzania. In the words of his supervisors, "Always with a positive attitude, friendly smile, and extraordinary work ethic he inspires his hallway neighbors with his presence... a more deserving individual than Javier there cannot be for this award."

In Memoriam - Bobby Lakin

Robert (Bobby) Lakin (BS '65) of Sparta, passed away Saturday, May 7, 2016, after a long battle with cancer. He graduated from Virginia Tech and had a career as an electrician for over 30 years. Bobby loved cooking for friends and family and his kitchen was affectionately named "Lakin's Tavern." He was 72 years old.



Please take a few moments and fill out our alumni update form

<http://www.bse.vt.edu/alumni/index.html>

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