

# Biological Systems Engineering *Newsletter*

Fall 2015

## In this issue

Note from the Department Head .....	2
Department News .....	2-3
BSE Student News .....	4-9
BSE Faculty and Staff News .....	10-13
BSE Alumni News .....	14-15

## We're growing!

### **BSE undergraduate students:**

192 undergraduate students (sophomores through seniors)

- originate from 6 countries (Belize, China, Mexico, South Korea, United States, Zambia) and 19 states (CA, CT, DE, GA, IL, MA, MD, MN, NC, NE, NH, NJ, NY, OH, PA, SC, TN, VA, VT)
- 50% of students are women, as compared to the College of Engineering average of 21.4% in 2015.

### **BSE graduate students:**

- 59 graduate students (MS and PhD)
- originate from 14 countries (Brazil, China, Ethiopia, Ghana, Honduras, India, Iran, Nigeria, South Korea, Sri Lanka, Tanzania, Tunisia, Turkey, United States) and 15 states (GA, IA, ID, KS, MD, MI, NC, NY, OH, OK, PA, SC, TN, VA, WV)
- 37% of students are women, as compared to the College of Engineering average of 23% in 2015.



## BSE Fall Picnic and Expo

Per our new tradition, BSE began the 2015-2016 academic year with the annual BSE fall picnic and expo. Booths with hands-on activities and posters exhibited the varied research and extension interests of the department, as well as student opportunities such as ASABE, GSO, Alpha Epsilon, and BSE Ambassadors. Faculty, staff, and students mingled and later enjoyed a buffet meal in the Ag Quad. Displays and research group “hosts” included:

BSE associate professor **Tess Thompson**’s graduate students, **Mehdi Ketabchy**, **Akin Akinrotimi**, **Elizabeth Hickman**, and **Chelsea Corkins**, demonstrated how engineered “in-stream” structures are used to change flow conditions in a small rectangular channel. Students were able to build their own instream structures out of rocks and then observe the effects on water flow. (*pictured above*)

**Pedro Ivo Guimarães**, a PhD student in BSE associate professor **Ryan Senger**’s research group, demonstrated that anaerobic bacteria can be used to break down certain wastes into nitrogen-rich growth media used to grow cyanobacteria and algae that are capable of producing high-value chemicals such as biofuels, bioplastics, and pharmaceuticals. (*pictured on page 3*)

PhD student **Prasanth Valayamkunnath**, with BSE assistant professor **Venkat Sridhar**’s group, demonstrated the process of cloud formation in the lower boundary layer of the troposphere with a bottle-cloud experiment, and how precipitation can be affected by temperature. (*pictured on page 3*)



**Mary Leigh Wolfe**  
*Professor and Department Head*

## You've come a long way...



Mary Leigh Wolfe ~ 1993-1994 checking out the John Deere tractor as a new BSE faculty member at the Shenandoah Valley Farm Equipment Show



Mary Leigh Wolfe, ASABE president 2015-2016, presiding at the Fall 2015 ASABE Board of Trustees meeting in Chicago

Dear BSE Alumni and Friends,

We were very pleased to welcome a very large class of new graduate students to BSE in fall 2015, bringing our total number of graduate students to 59, comprised of 39 PhD and 20 MS students. I commend all BSE faculty for conducting strong research and extension programs that attract outstanding students and for obtaining funding from sources such as the National Science Foundation (NSF), U.S. Department of Agriculture (USDA), and National Institutes of Health (NIH) to support graduate students. Thank you also to the College of Engineering (COE) and the College of Agriculture and Life Sciences (CAL S) for providing financial support for some graduate assistantships and fellowships.

With our increased student enrollment, we are finding BSE courses being taught in a variety of buildings in addition to Seitz Hall, including Agnew, Goodwin (new engineering building), Litton Reaves, Saunders, and Torgersen. BSE faculty and students are getting lots of exercise! While we are not able to increase the size of classrooms in Seitz Hall, we are able to continually improve teaching labs. Seniors are now using the new senior design lab/workshop in Seitz Hall. We started updating equipment in the unit operations teaching lab in Agnew Hall in spring 2015 and have completed the upgrade for spring 2016. The undergraduate teaching lab in 109 Seitz Hall (which some of you remember as the water quality lab) provides great space for hands-on experience in our classes.

Each time I write this column for the newsletter and think about the great faculty and students in BSE, I wish that you, BSE alumni, could meet with them and see for yourselves (beyond the great things you read in the newsletter) why I am so excited about and proud of BSE faculty and students. So, I would like to provide opportunities for BSE alumni to do just that – meet with current students and faculty. Those gatherings can occur in Blacksburg and in various locations outside of Blacksburg. I need your help to plan gatherings that would work best for you. Please go to the BSE website (<http://www.bse.vt.edu>) and click on the “Alumni” link in the middle of the left-hand column to provide feedback to help us plan. Thank you in advance for your help – I look forward to your feedback and ideas!

We are excited to introduce BSE's new look! We hope you like it, too.

Please visit us in Blacksburg and/or join us for a BSE gathering where you live .

Best wishes for an outstanding 2016!

*Mary Leigh Wolfe*

## Valued Contributors to BSE (6/1/15 - 11/30/15)

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 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](mailto:barbt@vt.edu), [mlwolfe@vt.edu](mailto:mlwolfe@vt.edu)) if your name has been omitted from this list.

Collins, Eldridge  
Comer, George  
Dominion  
Ford, William Craig  
Hale, Edward  
Leach, Charles  
Massie, Fred  
Pitman, Robert  
Southerly, Andrew  
Tang, Jing  
Wells, Donald  
Yagow, Eugene



*BSE MS student Breanne Ensor explains methods for measuring greenhouse gas fluxes from floodplain soils to the BSE Advisory Board at the StREAM Lab tour*

## BSE Advisory Board

On October 22, 2015, BSE Advisory Board members provided advice to BSE students through the third annual Career Panel in the department. Board members answered a range of questions from undergraduate and graduate students about topics including professional preparation, applying for jobs, interviewing, and on-the-job expectations. Following the panel discussion, students and Board members continued their conversations over dinner. The students greatly appreciated the opportunity to talk with Board members and hear excellent advice.

The following day, the Advisory Board met for its fall meeting. One portion of the meeting focused on Board members and faculty members getting to know each other better through two-minute (or a little longer) self-introductions. Board members noted that knowing more about the faculty's programs would help the Board identify how to help the department. The Board also gave great feedback to the senior design teams. Each team presented their problem statement, design criteria and constraints, and brief progress report. The Board also provided feedback on the ongoing development of the Biodesign and Bioprocess Research Center, as well as on strategic planning for the Center for Watershed Studies. The Board wrapped up the day by getting their feet wet on a tour of the StREAM Lab.

## Thompson Study-Research Leave

BSE associate professor **Tess Thompson** was on a study-research leave (sabbatical) for the first half of 2015. While on leave she developed a new senior/graduate course called Fluvial Forms and Processes. This course provides an understanding of stream physical processes for engineering and science students whose work focuses on stream systems and fills a critical gap in the senior/graduate course offerings at Virginia Tech. While there are several stream-related courses on campus, none of these courses focus on the fundamental physical processes that control the form of stream channels. This knowledge is a necessary foundation for understanding and managing streams and lotic ecosystems. To reach students on both the main and extended campuses, as well as working professionals, the course was developed in an online format with a single Saturday field day. There are 22 students enrolled in the course, which is a large number of students for a new senior/graduate course. Three students are located remotely and two are working professionals.

Thompson also took the opportunity to travel while on sabbatical, visiting southern Germany, Austria, and Switzerland. In addition to taking pictures of streams (highly modified!) in Europe, she met with Andreas Schönborn, the former president of the International Ecological Engineering Society and a faculty member in ecological engineering at the Institute of Natural Resources Science, Zurich University of Applied Sciences in Waedenswil, Switzerland.



*A "green wall" at the Institute of Natural Resources Science, Zurich University of Applied Sciences, Switzerland*

- Fall Picnic and Expo *continued from page 1*

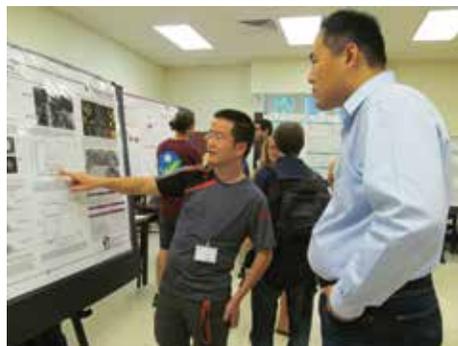


*Pedro Ivo Guimarães*



*Prasanth Valayamkunnath*

**Yun Hu**, a postdoctoral associate working in BSE professor **Mike Zhang's** lab, presented a nanoparticle based nicotine vaccine that is designed to induce the production of nicotine specific antibodies. These antibodies can bind to nicotine molecules in the blood and sequester them in blood, thereby reducing the rewarding effect from tobacco smoking and leading to smoking cessation.



*Yun Hu*



## ASABE Student Branch News

This semester ASABE has been up to a lot! With plans to host the 2016 Southeastern ASABE Student Rally in April in Blacksburg, we have dedicated a lot of time to fundraising. We have had a Moe's Benefit Night, did odd jobs for the College of Engineering, and held a "Raking Dead Fundraiser", where we raised almost \$1,200 doing yard work around town. We also hosted our annual ASABE Pig Roast for the students and faculty that was a huge success.

We have had a few guest speakers as well. Claire Childress from Career Services came to talk to students about resumes and cover letters and Sam Reilly came to talk about opportunities at Saha Global. We had our annual pumpkin carving event with the students for Halloween. We also hosted a stream clean up at the StREAM Lab with AWRA. We are currently looking forward to our events next semester as well as hosting Rally 2016!

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

## Alpha Epsilon (BSE Honor Society)



*Akin Akinola, Jordan Wetzig, and Imen Tanniche*

The Virginia Tech Eta Chapter of Alpha Epsilon (AE) had another great year. We would like to acknowledge the former AE president, **Jiun Yen**, for his outstanding leadership over the past year. Once again, AE received the 2015 Outstanding Chapter Award.

For this year, AE officers are **Imen Tanniche** (President), **Heather Govonor** (Vice President), **Jae Eung Kim** (Secretary), **Jordan Wetzig** (Treasurer), and

**Akin Akinola** (Officer At Large). We started the fall semester by hosting an ice cream social event. Undergraduate and graduate students gathered and shared their thoughts and ideas regarding upcoming events and activities organized by AE. We also organized a clothing and food drive for the Montgomery County Emergency Assistance Program (MCEAP). Donations included gently used shoes, outdoor cold weather clothing, and canned food.

AE is looking forward to another fruitful year with events including Pizza Friday, Veggie Share, Kid's Tech, The Big Event, shared activities with GSO, and more.

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

## New Addition – Congratulations!

BSE graduate student **Stephanie Houston** and her husband Brian welcomed their daughter Caelyn Xi-Ning Houston into the world in August 2015. Caelyn arrived a couple weeks early and weighed in at 5 lbs 2 oz, but is doing well and growing rapidly.





*Heather sampling at StREAM Lab*

## Governor receives Interfaces of Global Change Fellowship

Doctoral student **Heather Governor** received an Interfaces of Global Change (IGC) fellowship for the 2015-2016 year. The IGC is an innovative new on-campus center that aims to “address the challenges to the environment and society resulting from global change”. Heather has participated in the IGC’s doctoral program since beginning her PhD in BSE in January 2014. Her work focuses on identifying the mechanisms that underlie losses in benthic macroinvertebrate abundance and diversity in streams with measures of high sediment. The fellowship covers both Heather’s tuition and stipend, enabling her to spend much of this academic year collaborating with the Virginia Department of Environmental Quality. She is co-advised by BSE professor **Cully Hession** and assistant professor **Leigh-Anne Krometis**.

### BSE is on Facebook!

Virginia Tech Biological Systems Engineering  
<http://facebook.com/vtbse>

VT BSE Alumni  
<https://www.facebook.com/groups/vtbsealumni/>

## International students benefit their home countries

Over the years, the BSE department has been fortunate to have many international graduate students pursue research studies that directly benefit their home countries. Here we profile three of those international graduate students and share their research projects and experiences.

PhD candidate **Clara Bernice Darko**’s research under BSE professor **Kumar Mallikarjunan** is investigating appropriate systems for storing peanuts along the supply chain in Ghana that are adaptable and affordable. Her work will help peanut farmers, traders, and processors choose the appropriate pre-storage treatment, packaging materials, and storage structures to reduce or eliminate aflatoxin production and, therefore, improve peanut production and increase profit margins. More importantly, this research will lead to a reduction in child mortality rates in Ghana, sub-Saharan Africa, and other developing countries, since peanuts are one of the main food staples in these countries.



*Clara Darko with peanut processors in Ghana*

**Denis Olgen Kiobia**, also working under BSE professor **Kumar Mallikarjunan**, designed and developed a low-cost acoustic device to detect pest infestation in stored maize, earning an MS degree this past summer. Since insect damage in stored maize is one of the major post-harvest losses occurring in developing countries, especially in sub-Saharan Africa, separation of infested grains from clean ones is critical to reduce economic losses. His prototype device is portable and includes a microphone, signal conditioning circuit, and a microcontroller. Perhaps

most importantly, it could be manufactured for \$55 or less compared to current devices, which cost around \$5000.



*Denis Kiobia analyzing the acoustic behavior of maize weevils in the lab*

**Winfred Mbungu** is a current PhD student working under BSE associate professor **Conrad Heatwole**. Winfred is investigating the impacts of climate, landscape, and land use changes on the quantity and quality of streamflow and soil erosion in the Upper Ruvu watershed in Tanzania. This watershed is critical for the water supply of the city of Dar Es Salaam (population approximately 5 million), and is currently undergoing rapid changes that threaten sustainable provision of ecosystem services. The findings from Winfred’s research will be useful to the Wami/Ruvu Basin Water Office as they focus on efforts to plan and implement watershed conservation and reduce water quality degradation in the watershed.



*Villagers observing the rainfall simulator experiments in progress (Winfred Mbungu wearing hat.)*



## Graduate Student Organization (GSO)

The Graduate Student Organization (GSO) kicked off the academic year by assuming its traditional role in support of the BSE Welcome Back Picnic, helping out by recruiting and directing hard-working student volunteers. While GSO plays a part in promoting social events in the department, the main focus of the organization is strengthening graduate student cohesion—last year’s quite successful endeavors included hosting the popular Chili Cook-off—and we plan to continue to strive to build community in our department. This semester we are pivoting GSO to become a representative body for BSE graduate students in order to better advocate for our collective interests. We intend to provide a platform for discussion among students and to work in collaboration with the faculty and staff to enhance the graduate student experience. The new team of GSO officers this year is: **Emily Bock** (President), **Andrew Sommerlot** (Vice President – Land and Water), **Pedro Ivo Guimaraes Braga de Silva** (Vice President—Bioprocessing), **Akin Akino-la** (Secretary), and **Chelsea Corkins** (Treasurer). We look forward to serving the graduate student body as we strive to respond to graduate student needs.

With Hokie Pride,

**Emily Bock**

GSO President 2015-2016

## New Graduate Students - Fall 2015

**Graduate Student (Advisor)**

### MS Students

- Jacob Cantor** (Krometis) - BS Biological Systems Engineering, Virginia Tech, 2015  
**Brady Coleman** (Easton) - BS Geology, College of William and Mary, 2015  
**Dylan Cooper** (Scott) - BS Biological Systems Engineering, Virginia Tech, 2015  
**Kathryn Douglass** (Scott) - BS Biological Systems Engineering, Kansas State University, 2015  
**Elizabeth Hickman** (Thompson) - BS Biosystems Engineering, Oklahoma State University, 2015  
**MaryJoe Rice** (Ruder) - BS Biological Systems Engineering, Virginia Tech, 2015  
**Daniel Robinson** (Sample) - BE Environmental Engineering, Mercer University Macon, 2013  
**Vinit Sehgal** (Sridhar) - BE Civil Engineering, Birla Institute Tech, 2013  
**Travis Spangler** (Sample) - BS Mechanical Engineering, Virginia Tech, 2011  
**Jordan Wetzig** (Krometis) - BS Biological Systems Engineering, Virginia Tech, 2015  
**Lauren Wind** (Hession/Krometis) - BS Environmental Science, Alleghany College, 2015

### PhD Students

- Carter Berry** (TBD) - BS Chemical Engineering, Virginia Commonwealth University, 2014; BS Chemistry, Virginia Commonwealth University, 2014  
**Sravanthi Budaraju** (Mallikarjunan) - MENG Food Engineering, Annamalai University, 2011; BTECH Food Science and Technology, Osmania University, 2009  
**Laura Hanzly** (Barone) - MS Biological Sciences, State University of New York, 2015; BS Mathematical Physics, State University of New York, 2013; BS Biological Sciences, State University of New York, 2013  
**Herbert Huttanus** (Feng) - MS Materials Science and Engineering, Boise State University, 2014; BS Biological Sciences, Boise State University, 2011  
**Mehdi Ketabchy** (Sample/Thompson) - MS Environmental Engineering, Sharif University Tech, 2013; BS Civil Engineering, Babol University of Technology, 2010  
**Qualla Ketchum** (Hession) - MS Biological and Agricultural Engineering, Oklahoma State University, 2015; BS Biological and Agricultural Engineering, Oklahoma State University, 2013  
**Muzi Li** (Ruder) - BS Biological Sciences, Huazhong University of Science and Technology, 2014  
**Yi Lu** (M. Zhang) - BS Chemical Engineering, University of California Berkeley, 2012; AS Chemistry, Laredo Junior College, 2010  
**Kyle Saylor** (M. Zhang) - BS Chemical and Biological Engineering, University of Tennessee Knoxville, 2014  
**Madusanka Thilakarathne** (Sridhar) - MENG Water Resources Engineering, Asian Institute of Technology, 2014; BSCE Civil Engineering, University of Peradeniya Sri Lanka, 2011  
**Chaochen Wu** (Feng) - BS Biochemistry, Xiamen University, 2014

## Inventing your (career's) future through internships

Many of our undergraduates use the summer to explore job opportunities and invent their (career's) future through internships.

Life on the job shows our students just how diverse and interdisciplinary the workplace can be and sometimes leads them to unexpected but rewarding positions. BSE sophomore **Jenna O'Brien** worked for GE Aviation at jet engine testing facility in Peebles, OH, where she was an assembly, test, maintenance, and repair operations co-op. Meanwhile, BSE senior **Alexander Padilla** spent the summer in Washington, DC at the Department of Treasury at the Bureau of Engraving and Printing. A position at the Treasury as a general engineer was perfect for Alexander, who wants to work for the federal government after graduation.



*Alexander Padilla on the left at the Treasury*



*Jenna O'Brien on the far left with a jet engine at GE*

Some students find positions that take them to the factory floor or into the lab! BSE senior **Kindell Schmitt** worked as a manufacturing intern for Mondelez International (Nabisco) in Richmond,

VA, where she did continuous improvement work on one of the Ritz crackers lines. BSE sophomore **Taylor Lohneis** worked as an intern at GlaxoSmithKline in Rockville, MD. Over the summer Taylor completed a biowaste inactivation study using Chinese hamster ovary cells, and performed multiple risk assessments for equipment and procedures.



*Kindell Schmitt in front of the plant*

Meanwhile, other students have internship experiences that keep them in the field. BSE sophomore **Samuel Withers** worked for Engineering Consulting Services in Asheville, NC with their Construction Materials Testing Department. This required Samuel to spend a lot of time (in appropriate PPE) on construction sites doing tests to ensure design specifications were met. BSE senior **Daniel Smith**



*Samuel Withers on site*

secured a summer position at the Virginia Tech Power Plant. Daniel says this internship gave him the chance to apply knowledge from many classes in the BSE curriculum, including thermodynamics, transport processes, instrumentation, plant design, and economics.



*Daniel Smith in the steam tunnels under VT!*

As ever, one of the most rewarding parts of any summer internship for our students is the possibility that a few months' experience will prove such an excellent fit for all involved that it leads to a full-time position post-graduation. BSE senior **Demetrius Lunsford** worked last summer at a Gatorade facility in Wytheville, Virginia, and completed a project on inventory cost efficiency and distribution of center software. The project and experience was so successful Demetrius has already accepted a full-time position with PepsiCo (who owns Gatorade) that will begin after graduation.

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

## Congratulations to ten BSE graduate students who completed their degrees

### MS Degrees Completed Spring 2015



**Kinsey Hoffman** (Advisor: **C. Hession**), *Ecohydrologic Indicators of Low-flow Habitat Availability in Eleven Virginia Rivers*. Kinsey has been working on projects for New York City Department of Environmental Protection (NYC DEP), the Susquehanna River Basin Commission (SRBC), and NASA since graduating.



**Denis Kiobia** (Advisor: **K. Mallikarjunan**), *Design and Development of an Acoustic Based System to Detect Pest Infestation in Stored Corn*. Denis is an assistant lecturer on post-harvest engineering at the Sokoine University of Agriculture in Tanzania.



**Felicia Scott** (Advisor: **W. Ruder**), *Surface Displayed SNAP as a New Reporter in Synthetic Biology*. Felicia is continuing her research as a PhD student in the BSE Department.



**Wesley Tse** (Advisor: **B. Benham**), *Examining the Influence of Wildlife Population and Fecal Coliform Density Variability on Virginia Bacterial TMDL Development*. Wesley is employed in the BSE Department as a project associate in the Center for Watershed Studies, where he continues his TMDL research.



**Ruihua Zhang** (Advisor: **W. Ruder**), *Developing New Modalities for Biosensing Using Synthetic Biology*. Ruihua works as a research assistant in BSE assistant professor Warren Ruder's lab.

### PhD Degrees Completed Spring 2015



**Nicholas Cook** (Advisors: **L. Krometis**, **E. Sarver**), *Surface Water Quality and Ecological Health in Central Appalachian Streams*. Nick has taken a postdoctoral position in the Forestry Department at Oregon State University where he will be using advanced geo-statistical techniques to understand the ecological impacts of logging at the watershed scale.



**Hehuan Liao** (Advisor: **L. Krometis**), *Improving Microbial Fate and Transport Modeling to Support TMDL Development in an Urban Watershed*. Hehuan is working in BSE as a postdoctoral associate with Leigh-Anne Krometis (BSE assistant professor) and Emily Sarver (Mining Engineering assistant professor) where she is investigating the effects of landuse on in-stream conductivity in Central Appalachia.



**Yun Hu** (Advisor: **M. Zhang**), *Development of Nanoparticle Based Nicotine Vaccines for Smoking Cessation*. Yun is currently working as a postdoctoral associate with BSE professor Mike Zhang. His research focus is biodegradable nanoparticle based nicotine vaccine for smoking cessation.



**Nate Jones** (Advisors: **D. Scott**, **C. Hession**), *Floodplain Hydrology and Biogeochemistry*. Nate is a postdoctoral researcher of ecohydrology in the Forest Resources and Environmental Conservation Department at Virginia Tech. He is developing a mechanistic model, the Wetland Hydrologic Conductance Model, that simulates surface water-groundwater interactions at the wetland scale.



**Kelsey Pieper** (Advisor: **L. Krometis**), *Characterizing Waterborne Lead in Private Water Systems*. Kelsey is now a postdoctoral fellow in environmental engineering at the University of North Carolina. She is active on several projects aimed at characterizing disparities in domestic access to safe drinking water.

## Summer Undergraduate Research Experiences

In addition to summer internships, many of our BSE undergraduates pursue research experiences at different laboratories all over the country. Not surprisingly, their specific experiences are diverse, but together collectively demonstrate the universal drive and commitment of our students to invent the future.

Student research internships often take students to locations all over the country. BSE senior **Katelyn Fernandi** spent her summer at Rutgers University's Aquaculture Innovation Center, where she split her time working in an oyster hatchery and taking care of horseshoe crab eggs and larvae. BSE junior **Robert Accolla** spent his summer at the Lawrence Berke-



*Robert Accolla in the lab*

ley National Laboratory as part of the U.S. Department of Homeland Security (DHS) HS-STEM Summer Internship Program. Robert researched peptoid nanosheets, a synthetic material that researchers hope can be used in drug discovery, diagnostics, and drug delivery.

In keeping with growing interest and investments in the field of biomedicine, several students worked on research projects within schools of medicine. BSE senior **Heather Bomberger** completed an internship at the UVA Department of Pathology investigating the use of antibodies in cancer treatment. BSE sophomore **Elaina Passero** worked for the Schizophrenia Neuropharmacology Research Group at Yale School of Medicine this summer, and supported a team focused on defining interactions between THC and nicotine by looking at changes in cognition and brain activity.

Of course, students also found their skills could support diverse research projects here in our own Blacksburg "backyard"! BSE junior **Justin Haber** worked for BSE assistant professor **Zach Easton**

on a bioreactor project. Justin completed a great deal of field work, traveling throughout sites in the Chesapeake Bay watershed to collect water samples and maintain automatic sampling and data collection equipment. While still based on the Virginia Tech campus, BSE senior **Alex Kwiatkowski's** experience was very different: she spent her summer working at the Virginia-Maryland Regional Veterinary School on a project focused on toe regeneration in mice.



*(Left) Alex Kwiatkowski getting ready to enter the mice room*

*(Below) Justin Haber taking samples*



## BSE Senior Design Team presents at BMES Conference



*BSE Design Team presenting at the 2015 BMES Annual Conference (photo provided by Sarah Steinke)*

Four recent BSE graduates had the opportunity to share their senior design project with a national audience. **Kathryn Brown**, **Nick Offerjost**, **Michael Scimeca**, and **Sarah Steinke** were invited to attend the Biomedical Engineering Society

(BMES) Annual Conference in Tampa, Florida in October to present their project, "Production of a Raman Sensor to Track Patient Progress during Hemodialysis." BMES undergraduate student members were encouraged to submit proposals on their design projects for a student design competition. The 2015 design theme was "Bioinstrumentation." The Virginia Tech BSE team was one of only six teams chosen to present their work at the national competition.

The BSE team, with support from their advisors BSE associate professor **Ryan Senger** and BEAM professor John Robertson, designed a prototype sensor that uses a sampling chamber coupled with a Raman Spectrometer to collect

dialysate waste fluid and monitor the presence of small molecules (e.g., urea and uremic toxins) while a patient is undergoing hemodialysis. The creation of this device will allow a doctor to get real-time feedback on how a patient is responding to hemodialysis therapy and provide an individualized treatment plan based on the results. The end result will be an improved quality of life and well-being for hemodialysis patients.

While the BSE design team did not win the competition, team member Sarah Steinke stated, "We were very proud of the outcome of our presentation and the attention it brought to our project and need of improvement for hemodialysis patient monitoring."



*Cully Hession with the new VAPOR 35 helicopter.*

## BSE Drone!

The BSE Department recently purchased a VAPOR 35 (Pulse Aerospace, Inc.) electric powered, advanced helicopter Unmanned Aircraft Vehicle (UAV or “drone”) with partial funding from SCHEV-ETF 2014. This UAV has a gross weight of 30 lb., 45-60 min flight times, and can handle payloads of up to 5 lb. (after batteries). The UAV is currently equipped with the VAPOR Precision Mapping Payload, allowing us to conduct precision aerial mapping for research on streams, forests, and agricultural crops. Future research plans involve purchasing and deploying additional payloads including multi-spectral scanners, video cameras, and laser scanner systems (e.g. LiDAR). There are numerous faculty in CALS that contributed matching funds and are interested in the use of UAV for various aerial mapping activities. BSE professor **Cully Hession** and Environmental Research Manager **Laura Lehman** completed training for the UAV and flight control system during this past summer. The department is currently working through the registration and licensing process with FAA for the VAPOR 35.

## Mallikarjunan receives 2015 Kishida International Award

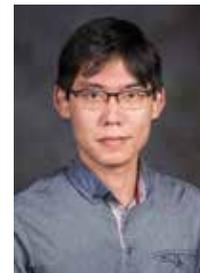
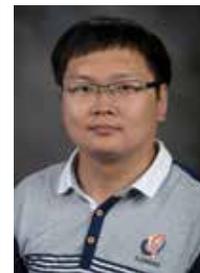
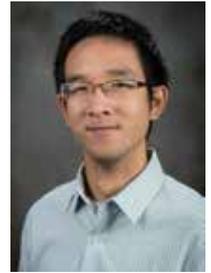


BSE professor **Kumar Mallikarjunan** is the recipient of the 2015 Kishida International Award from ASABE for his distinguished leadership contributions to engineering, mechanization, and technological programs in education, research, and technology transfer, which have resulted in significant improvements to worldwide food safety and quality.

Read more - [www.vtnews.vt.edu/articles/2015/09/090315-cals-kishidaaward.html](http://www.vtnews.vt.edu/articles/2015/09/090315-cals-kishidaaward.html)

## Welcome New BSE Research Faculty!

**Wesley Tse** is a new project associate in BSE. Tse completed his MS in BSE in the spring of 2015 under the direction of **Brian Benham**, BSE professor. A Maryland native, Tse graduated from the University of Maryland with a BS in Civil Engineering in 2010. During his graduate studies at Virginia Tech, Tse worked for the Center for Watershed Studies helping to develop bacteria TMDLs and for the College of Engineering providing IT support for the Ware Advanced Engineering Lab and Invents Teaching Lab. In his current role in BSE, he is working with Benham’s group on various water quality projects funded by the Virginia Department of Environmental Quality.



**Hui Chen** and **Eui-Jim Kim** joined BSE professor **Percival Zhang’s** research group in August 2015 as a postdoctoral associate and research associate, respectively, working under a Department of Energy (DOE) grant. Chen’s key goal is to scale up sweet hydrogen production from biomass catalyzed by enzyme cocktails. During this

project, he will mass-produce all enzymes, change the cofactor preference of dehydrogenase to less-cost and more-stable biomimetic coenzymes, and validate the technological feasibility of large-scale enzymatic hydrogen production. Kim’s goal is to increase volumetric productivity of enzymatic hydrogen production. His research plan includes the construction of an artificial electron transport chain and

*- continued on page 11*

## Krometis receives 2015 ARIES Researcher of the Year Award

BSE assistant professor **Leigh-Anne Krometis** and collaborator Emily Sarver, Mining and Minerals Engineering Department assistant professor, were co-recipients of the Appalachian Research Initiative for Environmental Science (ARIES) Researcher of the Year Award for 2015. For the past four years, Krometis and Sarver have run an ARIES-sponsored project investigating the in-stream ecological impacts of both coal mining and inadequate sanitation in historical coal camps along the Virginia-Kentucky border. The project's upcoming fifth year will focus on linking years of clustered watershed monitoring with potential public health risks. Krometis accepted the project award at the Environmental Considerations in Energy Production conference in Pittsburgh in September, and attributes the project's success to its interdisciplinary focus, great faculty partnership, and the hard work by project students and associates: **Nick Cook** (PhD, 2015), **Jake Cantor** (MS, current), and **Hehuan Liao** (postdoc, current).

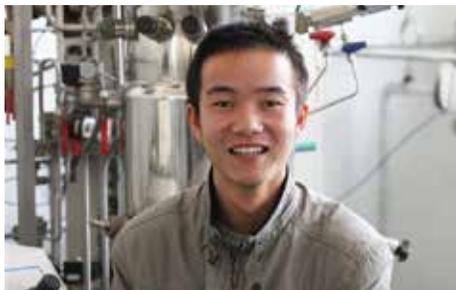
*Leigh-Anne accepting the award, which includes an original drawing by Appalachian artist Ashley Cecil, from Dr. John Craynon of ARIES*



- Research Faculty continued from page 10

synthetic enzyme complexes featuring electron channeling. Enhanced production rates will decrease capital investment requirements, hopefully stimulating more applications of this technology which will eventually lead to sugar fuel cell vehicles.

**Yun Hu** joined the BSE Department in October 2015 as a postdoctoral associate with BSE professor **Mike Zhang** after



receiving his PhD degree in the Virginia Tech BSE department. Hu is currently working to develop a nicotine vaccine for smoking cessation. His PhD study focused on making nicotine vaccines using different nanoparticles as a delivery system. He will engineer biodegradable hybrid nanoparticles to produce nicotine vaccines of higher immunogenicity and better safety. His short term goal is to put these nicotine vaccines into a clinical trial.

**Song Lou** also joined Mike Zhang's group as a postdoctoral associate this year. Lou received his PhD from the Chinese Academy Sciences, with research using analytical chemistry to examine plant-based medicines. He also trained in an-

- continued on page 13

## Governor's School for Agriculture

The Governor's School for Agriculture (GSA) is a summer residential program held for rising high school juniors and seniors that provides these students with opportunities to interact with professors, researchers, and graduate students on the Virginia Tech Blacksburg campus. This summer, our department hosted a group of 20 GSA students who selected Biological Systems Engineering as an elective for an immersive two-day workshop.

Students were introduced to the general BSE discipline, as well as potential careers. Using EnVision™ Groundwater models, they explored hydrologic concepts and contamination pathways within the context of the Virginia Household Water Quality Program with senior extension associate **Erin Ling**. Students also visited the Bioresidue Utilization and Management Laboratory where undergraduate student **Sasha Howes**, working with associate professor **Jactone Ogejo**, explained research related to the generation of value-added products like biomethane from agricultural-based residuals/waste. The students also met with associate professor **Ryan Senger**, who explained how researchers look for methods to manipulate the genes of plants and microbes to convert renewable resources, such as carbon dioxide and cellulose, into fuels and valuable chemicals. Graduate students **Amanda Fisher** and **Pedro Ivo Guimaraes Braga de Silva** provided a virtual tour of the microscopic world of fungi and cyanobacteria via an iPhone-microscope application.



The following morning, graduate students **Chelsea Corkins** and **Akinrotimi Akinola** discussed erosion processes and the benefit different ground covers can have to prevent or slow down this soil loss and prevent water quality degradation in streams via an "immersive" demonstration with the rainfall simulator. In the afternoon, equipped with waders, nets, sampling trays and identification guides, students collected macroinvertebrates at Tom's Creek with **Asa Spiller** (BSE Water Quality Lab technician) and Erin Ling. This activity allowed students to link earlier discussions on water quality back to observations of macroinvertebrate habitat to better understand the keys to a healthy ecosystem. GSA students were a bright and enthusiastic bunch and we look forward to hosting another group next year! For more information on GSA, please visit:

<http://www.alce.vt.edu/governors-ag-school/>.

## BSE Faculty Promotions

Two BSE faculty members were promoted to associate professor and awarded tenure in August 2015. Congratulations to David and Ryan!



Before coming to Virginia Tech, **David Sample** spent over 20 years in environmental consulting, city and county government, and water management districts. Located at the Hampton Roads Agricultural Research and Extension Center (HRAREC) of Virginia Tech, Sample has developed strong, integrated research and extension programs focused on urban stormwater management.

His overall goal is to improve the design and implementation of best management practices (BMPs), including low impact development (LID), to improve the quality of urban stormwater. He conducts both field and modeling studies to evaluate and improve BMPs. Sample's extension program focuses on educating a range of clientele, from technical professionals to the general public. He has developed educational materials geared to specific audiences; particularly noteworthy are a series of BMP fact sheets and a website that provides detailed information from his urban stormwater program. Sample has secured funding to support his program from multiple sources, such as the National Science Foundation, the U.S. Department of Agriculture, the National Fish and Wildlife Foundation, Virginia Department of Conservation and Recreation, Virginia Department of Environmental Quality, and City of Virginia Beach. Sample has been an appointed member of the Chesapeake Bay Program Scientific and Technical Advisory Committee (STAC) since 2009. He is also on the Board of Environmental Advisors for the Washington State Department of Ecology Technical Acceptance Protocol - Ecology (TAPE) Program. Sample is an outstanding citizen of BSE and the HRAREC.



**Ryan Senger** has developed a strong research program focused on advancing metabolic engineering to develop new techniques that facilitate improved production of high-value chemicals from renewable resources; increased production of cellulose by plants, which can then be used to produce biofuels; and improved monitoring of physiological responses to toxins and therapeutic

agents, which will contribute to improved human health care. The scholarly work produced by Senger's research program includes refereed journal articles, book chapters, and software. It is noteworthy that he has made many software products available for free download, including databases and models for advancing metabolic flux modeling, and filed four patent disclosures for intellectual property developed while at Virginia Tech. He has been successful in obtaining research funding from multiple sources, e.g., the National Science Foundation, the U.S. Department of Agriculture, U.S. Department of State, and Jeffress Trust. Senger is an outstanding teacher. He has developed and taught two new graduate courses, Engineering Mathematics and Metabolic Engineering, and revised and regularly teaches two senior level courses, Bioprocess Engineering and Biological Process Plant Design. In 2012, he received a College of Engineering Outstanding New Assistant Professor Award. Senger co-advises our student chapter of the American Society of Agricultural and Biological Engineers (ASABE). He has developed a website to serve as a repository of internship and job opportunities for BSE students. Senger's collegiality is well-appreciated by BSE faculty, staff, and students.

## Sridhar receives funding for research involving climate change impact on transportation planning and design

BSE assistant professor **Venkat Sridhar** (Sri) and his UVA collaborator Jon Goodall received funding from the Mid-Atlantic Transportation Sustainability Center-Regional University Transportation Center Consortium led by the University of Virginia. This unique new project addresses challenges posed by sea level rise and climate change on transportation planning and design. Through partnerships with local non-federal agencies within the region, the research is expected to result in outcomes that have a direct impact on transportation planning and design within the region.

This study uses Hampton Roads, Virginia as a prototype and constructs design precipitation maps of daily duration for both historic and future scenarios for a range of existing downscaled global change model scenarios. High-resolution digital elevation model (DEM) data recently derived from a LiDAR data collection campaign is used to define the topology of the region at a high resolution. The updated design of a simple hydrologic model can track peak flows and water volumes during different storm return periods and their potential to cause flooding at high and low tide events. Modeling under different sea rise scenarios will be conducted to understand the impact of sea level rise on reoccurring flooding within the study region.



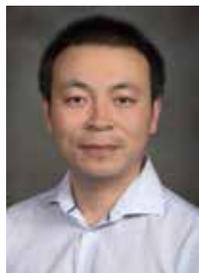
## Biodesign and Bioprocessing Research Center New Facility

The Biodesign and Bioprocessing Research Center (BBRC) was started in 2006 as a federally-funded partnership between the Biological Systems Engineering (BSE) Department and the biotechnology industry. For six years the BBRC funded bioprocess engineering projects ranging from basic science to commercial application. Now housed in the newly constructed Human and Agricultural Biosciences Building 1 (HABB1), the BBRC is looking for new industrial partners to collaborate on bioprocess engineering related projects. The BBRC occupies 3,227 ft<sup>2</sup> of the high bay lab and pilot space on the first floor of HABB1. The BBRC's space is modular and is designed to accommodate a variety of biotechnology efforts at any scale. Currently, the BBRC space houses aquaculture, biopolymer processing, small-scale fermentation, and biomimetic robotics projects. The BBRC is looking to grow in the specific bioprocessing areas of biomanufacturing, food processing and characterization, polymer processing and characterization, metabolic engineering, synthetic biology, protein engineering, and nutrient management. For more information, please contact BSE associate professor **Justin Barone**: [jbarone@vt.edu](mailto:jbarone@vt.edu).



BBRC is now housed in the new Human and Agricultural Biosciences Building 1

- Research Faculty *continued from page 11*



ti-cancer therapy and neurosciences at the University of Minnesota prior to coming to Virginia Tech. In BSE, Lou is conducting research on developing super-structured nanoparticles for antigen and drug deliveries.

**Hehuan Liao** joined VT in September 2015 as a postdoctoral associate working for **Leigh-Anne Krometis** (BSE assistant professor) and Emily Sarver (MinE assistant professor). Liao recently finished her PhD in BSE under Krometis, which focused on an interdisciplinary

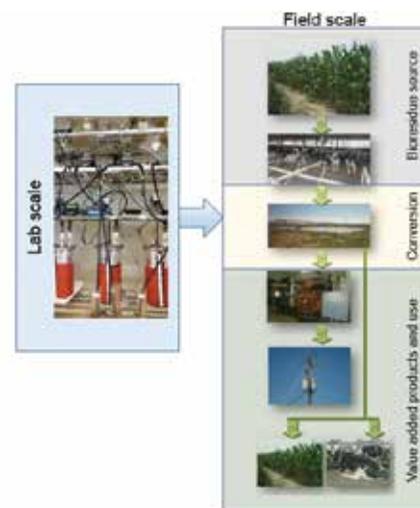
examination of microbial transport in urban streams, requiring work in the field, in the lab, and with hydrologic models. She then spent several months applying this knowledge to the development of TMDLs with **Karen Kline**, BSE research scientist. Liao's new project will focus on using geospatial statistical techniques to examine the relative effects of water quality and habitat stressors on benthic macroinvertebrates in the Appalachian Coalfields.



## Research Spotlight: Jactone A. Ogejo

My research program focuses on improving the management and use of bioresidues from agricultural/food production systems (livestock manure and food processing wastes) to minimize their negative impacts on the environment. I work on a variety of subjects including making manure a better fertilizer (balanced nutrients and pathogen reduction); mitigation of aerial emissions (ammonia, methane, carbon dioxide, hydrogen sulfide, nitrous oxide, volatile organic compounds) from stored manure; and recovery of other value added products, such as energy from bioresidues. I base my work on making manure a better fertilizer on the concept of "designer manure". Designer manure simply means changing manure composition to produce a nutrient balanced product to meet the specific requirements of crops. I also apply the concept to determine treatment needed for manure to meet organic fertilizer standards.

One example is our work with the adaptation of the supply chain model concept to assess the economics and guide the development and implementation of advanced anaerobic digesters and related technologies to recover high value products beyond biomethane from organic residuals on local farms and other public/private premises. Our specific interests in this area include identifying, quantifying, and assigning value to available bioresidues (feedstock) in the region; identifying potential value added products that can be derived from the bioresidues; and determining the parameters needed to successfully recover the value added products and deploy these technologies on farms through laboratory, pilot, and full scale studies.



Using lab scale reactors to improve the performance of an on-farm anaerobic digester (to improve the quantity and quality of the biogas and fertilizer value of dairy manure)

## ASABE Conference Blast from the Past

As our current BSE students prepare to host the 2016 ASABE Southeastern Rally, it's fun to remember past students' adventures with the society: Here, some past students relax along the Gulf Coast after the 1984 ASAE Conference in New Orleans. Recognize yourself?! Let us know - send Liza Spradlin ([lizaas14@vt.edu](mailto:lizaas14@vt.edu)) an update on events in your life and receive a BSE hat!



## BSE Alumni Open House



*BSE ambassadors Patrick Gallagher and Sasha Howes*

The BSE Department was delighted to hold an open house in conjunction with VT Homecoming on October 24, 2015. BSE ambassadors **Patrick Gallagher** and **Sasha Howes** were here to greet our alumni and those who came received a tour of the building, refreshments, and an opportunity to reminisce about their time in the department at VT. Below is

a picture of **Scott Brown** and his family who explored the second floor hallway to find his graduation picture among our past graduating class composite pictures.



*L-R Madeleine Starr, Leigh Starr, Scott Brown, Connor Starr*

## Alumni Updates

### 1980s

**Paul Saunders, Jr., PE (BS'80)** is the owner and land surveyor of Saunders' Surveys Inc. located in Roseland, VA where he resides with his wife Joyce and three sons Paul III, Brian, and Matthew. Saunders' Surveys offers professional surveying and engineering services to the central Virginia region and beyond. Services include site plans, drainage and stormwater management, boundary surveys, topographical surveys, construction stakeout, VDOT location surveys, sewer and water design and layout, hydrologic surveys for flood analysis, athletic facility design and layout, and surveys for photogrammetric work.



**Bradford Douglas** (BS'83) was recognized with the Award of Merit and title of fellow from the American Society for Testing and Materials (ASTM) International Committee D07 on Wood.

In bestowing this honor on Douglas, ASTM noted his leadership within the organization and many technical contributions to the development of ASTM wood engineering standards. He serves on several standards development committees of organizations including ASTM, American Society of Civil Engineers, and

the U.S. Federal Emergency Management Agency's Building Seismic Safety Council. Since 1987, Douglas has also served on U.S. model building code committees for the legacy Southern Building Code Congress International and International Council of Building Officials, and more recently the International Code Council addressing proper design of wood buildings to resist high wind and seismic loads.

### 2000's

The last year for **Nathan Staley** (MS '06) has included a new addition to the family, Reid (born October 2014), and a recent move to Salem. Nathan opened a Roanoke branch office for his company

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

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



*The Staleys' new addition*

Wetland Studies and Solutions, Inc. in May and continues to work on a mixture of stream restoration, watershed modeling, stormwater management, and low impact development projects – now mainly for clients in southwest and central Virginia. Nathan, his wife Heather, and their two children Emma and Reid are looking forward to being closer to home and plan to take advantage of all that the region has to offer!



*J.P., Sally Walker, and their newborn son*

**Sally Walker** (BS '07, MS'09) and husband Jason Pall welcomed son Jody in June 2015. Come say hello to the whole family at Glade Road Growing stand the next time you visit the Blacksburg Farmer's Market.

## 2010's

**Karen Hall** (BS'11, MS '13) is currently an engineer with Stantec in Richmond, VA. She is a certified VA Stormwater Combined Administrator, a certified Floodplain Manager, and a registered PE. Karen is concurrently working on her MBA at VCU.

**Brent Bunch** (BS'11) completed his Master of Engineering Management at ODU and is a registered PE in Virginia. He currently works for the US Navy.

**Kayla Reidenbach** (BS '13) has been working for Arcadis, a global design, engineering and management consulting company, for two years. She enjoys full-time work and is finally getting more responsibility and “cooler” projects to work on. Recently, she was in Iowa and North Carolina to investigate their storm and sewer infrastructure at two manufacturing plants. One of the plants made 60% of the nation's IV bags and she got to see exactly how they were made and kept sterile. The other plant was a gypsum mine that made drywall.

**Tammy Smith** (MS'13) married Josh Hayes in Gainesville, Florida, in April 2015 at Kanapaha Botanical Gardens. Tammy and Josh live in Gainesville, FL, with their dog Sebastian where she works as an environmental engineer at KMEA.



*Tammy Smith and her husband Josh Hayes*



*Haley Fuller enjoying one of her adventures*

Since graduation, **Haley Fuller** (BS'15) moved to the Washington D.C. area to begin a career as an associate scientist for the National Institutes of Health (NIH), specifically the National Institute of Allergy and Infectious Disease (NIAID). She is absolutely LOVING it so far! Haley is pictured with a friend on a celebratory trip to Thailand she took right after graduation, which she highly recommends.

**Michelle Halstead** (BS'15) has started a program with the Bredesen Center for Interdisciplinary Research and Graduate Education at the University of Tennessee, Knoxville, where she is an Energy Science and Engineering Fellow. She will be working jointly with BioEnergy Science Center (BESC) and the Center for Nanophase Materials Sciences (CNMS).

**Aidan Suiter** (BS'15) is a Water Resources Engineer I, at Thomas and Hutton Engineering Company, located in Savannah GA.

**Sarah Steinke** (BS'15) recently started a position as an engineer at Terumo Cardiovascular Systems. Her projects involve working with products that the company has and developing new ways to cut cost and save money either through redesign of a product or changing a manufacturing process. Sarah finds her new position interesting because she can use a lot of the engineering skills she learned in BSE in relation to real products, while learning about the financial side of the company.

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*New recruits in the fall 2015 Introduction to Biological Systems Engineering class get their hands dirty designing a sedimentation tank.*

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