

BSE NEWS

Virginia Tech Department of Biological Systems Engineering

FROM SEITZ HALL

Dear BSE Alumni and Friends,

It's been a very busy time in BSE since our last newsletter. During May's graduation ceremony (made more memorable by rain), 44 new BSE alumni received their Bachelor's Degree. Our incoming Fall 2022 sophomore class numbered 43, giving us a total undergraduate enrollment (Sophomore through Senior) of 142 students. Our current class of 57 seniors are making wonderful progress in Senior Design, co-instructed by Dr. Cully Hession and Dr. Wujin Sun, and I invite you to have a look at the many interesting projects that are underway. Our Senior Design course was also featured in the September/October issue of ASABE's Resource magazine, where you can learn more about some of last year's projects. Our graduate program is also on the upswing, ranked among the top 15 programs in the US with 50 MS and PhD students (our highest in the last five years) expected in Spring 2023.

We have been very well represented at ASABE meetings at both the national and regional levels this year. In major ASABE awards, BSE Senior Nicole Chapman was recognized as the recipient of the Robert E. Stewart Engineering Humanities Award. The Senior Design team of Nikki Borglin, Andy Steele, Brian Wilson and Kai Lawson won third place in the Gunlogson Environmental Design Student Competition for their project, "Peters Creek Restoration Design Package." Graduate students Kelly Graff, Xueyao Zhang, Rafael Iboleon, Suman Budhathoki, Hao Luo, Laljeet Sangha, Rana Genedy presented papers and posters at the ASABE Annual International Meeting in Houston. Twelve BSE students attended the Tri-State (Virginia, North Carolina, and South Carolina) ASABE meeting hosted by North Carolina State's Department of Biological and Agricultural Engineering in early November, with BSE graduate students Hoda Hammad and Rana Genedy winning awards for the Three-Minute Thesis Competition.

We have welcomed two new faculty to BSE, including Dr. Feras Batarseh in the cyberbiosecurity area and Dr. Zhiwu (Drew) Wang in the translational biotechnology area. We were also proud to announce our formal affiliation with Dr. Azahar Ali of the School of Animal Sciences, who works in the area of biosensor engineering and collaborates with several BSE faculty members. Our faculty have had a highly productive year in terms of research, including numerous high-impact publications and multiple major grants and awards. We have begun the search process for a new Ecological Engineer, which will broaden our research portfolio and make immediate impact on our teaching program.

Finally, I'd like to thank each of those who made gifts to BSE over the 2022 calendar year. Your generosity supports many activities that enrich the educational experience of BSE students, including support for professional meeting attendance, progress toward professional licensure, senior design (including national competitions), student recognition, international service, and many other activities. We couldn't do our work without you, and thank you for continuing to demonstrate Ut Prosim to the next generation of BSE graduates.

Wishing you and yours the happiest of Holiday Seasons,



Dwayne R. Edwards, Ph.D., P.E.
Professor and Department Head



COLLEGE OF ENGINEERING
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STAY CONNECTED

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WWW.BSE.VT.EDU

Follow us on social media for daily content, which includes announcements, event information, student features, departmental plans, and more!

 VTBSE

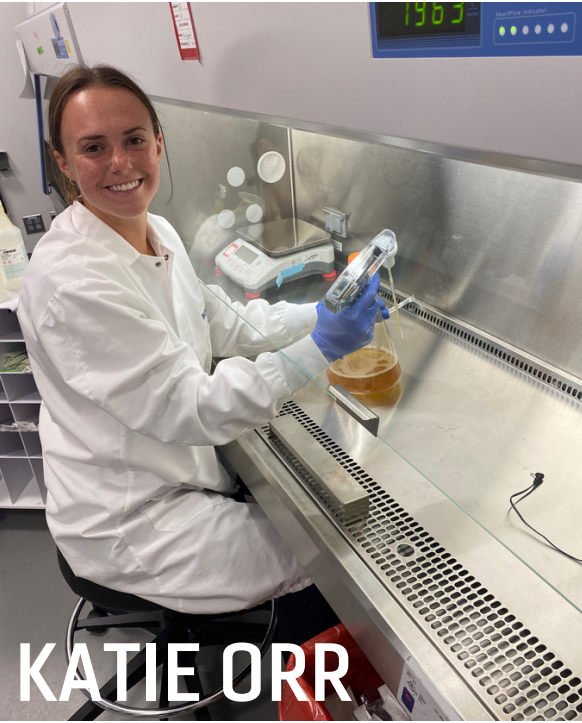
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 Biological Systems
Engineering at
Virginia Tech

STUDENT NEWS

Summer Internships and Co-op Opportunities



Katie Orr, junior, was an Upstream Bioprocessing Intern at Novavax, a biotechnology company based in Gaithersburg, Maryland that develops recombinant protein-based nanoparticle vaccines. Over the summer, she worked on the company's COVID-19 vaccine with the Upstream Process Development Department. Orr worked alongside two BSE alumni as she gained lab experience working with bioreactors and cell culture as well as experimental design and analysis. Some of her responsibilities included inoculating, infecting, sampling, and harvesting both shake flasks and bioreactors.

Orr also conducted experiments to evaluate how factors such as types of media or feed affect cell growth and recombinant spike protein production yield.

KATIE ORR



SAMANTHA SAN

Cameron Longmire, senior, (right) interned this summer at Catalent Pharma Solutions as a Quality Engineering Intern. During his internship, Longmire worked on logbook control policy and consolidation.



CAMERON LONGMIRE

Lexi Warren, senior, was among GROWMARK System's Class of 2022 Summer Interns. Warren worked for their member cooperative Southern States Cooperative and she learned about their precision agriculture technology and programs. Her duties included soil sampling, tissue sampling, and scouting fields.



LEXI WARREN

Samantha San, senior, interned at Merck in Elkton, Virginia over the summer where she learned about working in an industrial environment, practiced using analytical techniques such as XRF, SEM, and EDS to support production, and connected with fellow BSE graduates on site.

Summer Internships and Co-op Opportunities



Megan McCarthy, junior, interned at Ridge to Reefs this summer. She implemented bioreactors to filter and clean wastewater by using GIS mapping and large data sets. Her work helped to establish background information for remediation projects in Hawai'i, Maryland, Virginia, and Pennsylvania. McCarthy also received hands-on experience building compost sites in the Baltimore City area. In this picture, she is putting together a drip irrigation system to put on top of one of the compost sites she made to keep the soil moist.



Natalie Larsson, senior and accelerated master's student, interned with Virginia Tech Facilities this summer and worked alongside Katelyn Muldoon (left in first photo) to hold a Native Plant Sale hosted by SEEDS. This plant sale also served as an outreach event that educated the public about stormwater. Larsson also got to visit the Virginia Tech Quarry as part of her internship with Environmental Sciences student, Maggie Patterson (right in second photo). All Campus Planning, Infrastructure, and Facilities interns learned about the Hokie Stone process: from mining to placement on campus buildings.



Jaiden Shah, junior, interned at Axion Biosystems this summer. Axion Biosystems develops systems that enable scientists to study cells, disease models, and pharmaceuticals in the laboratory setting. During his internship, Shah worked on the mechanism the system uses to dock their microelectrode plates to the electronics, by determining placement and development of key components and performing reliability and life cycle testing. He also had the opportunity to work closely with mechanical and electrical engineers to assist with new product development.

Summer Internships and Co-op Opportunities



JULIA POST

This summer, Julia Post, senior, worked as a Water Resources Engineering Intern at Rummel Klepper and Kahl (RK&K). She's worked on a variety of projects that primarily focused around stormwater management and design. One of the tasks that Post accomplished during her internship was designing an open channel to replace an existing natural tributary in a neighborhood of Harrisonburg, Virginia, where there'd been a lot of flooding.

In the field, she did a lot of inspections for BMPs. Post and her coworkers worked together to ensure that they were functioning properly and that they didn't have any violations with the state. Post said that she gained a lot of experience in the water resources industry.

"The work environment was great - everyone has been very welcoming and fun to work with," Post said. "This position was a great learning experience for me and has definitely strengthened my interest in a potential career in water resources."

FUN FACT

Over 90% of BSE students participated in research, internships, and/or co-op experiences during their degree program.

Cassie Brisbin, junior, was a Mining Engineering Intern at Nutrien. This summer, she worked at the largest phosphate mine in the world in Aurora, North Carolina. She worked in the Mine Services department to assist in the improvement of quality of industrial water and in the reclamation process (i.e., restoring the land after it'd been mined.)

Brisbin also worked in the Mill department and learned about the process of separating mined contents to either distribute the contents to the chemical plant to form industrial products (phosphate) or to send contents over to reclamation areas (clay, sand, and sea shells).

In this photo, she is taking samples of each of the conditioner tanks in the flotation facility to form a composite sample to determine the granular size distribution.



CASSIE BRISBIN

Summer Undergraduate Research

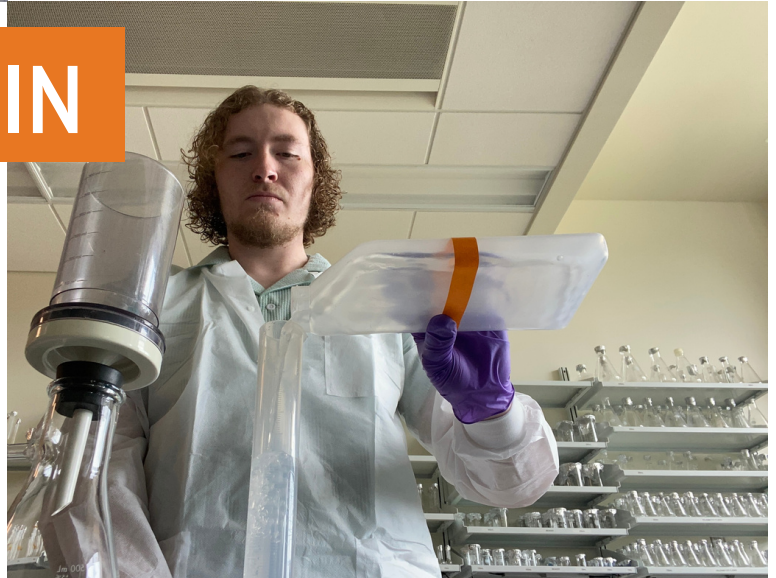
RONNIE DIFULVIO



Ronnie Difulvio, senior, (far right), worked on a number of projects alongside postdoctoral associate Qing Jin in Haibo Huang's lab in the Department of Food Science and Technology. Huang is an associate professor of food science & technology and an affiliate faculty member of the Department of Biological Systems Engineering. Difulvio's main focus was on the development of a continuous fermentation system using hollow fiber membrane technology to prevent bacteria from washing through the reactor. The lab is now using the fermentation system to produce acetone, butanol, and ethanol from waste byproducts. Difulvio's second project involved a study of dietary fiber strains on overall gut health, where she worked with a colony of mice to observe how different diets affect their colon health and gut microbiota.

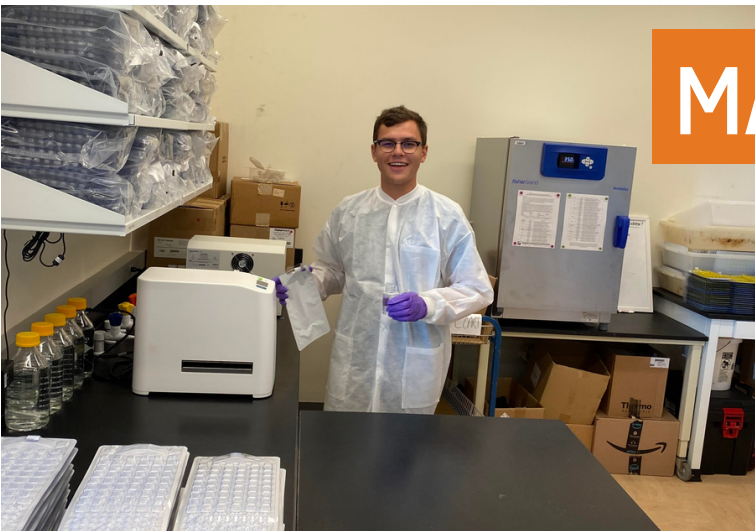
COLIN BALDWIN

Colin Baldwin, senior, completed research in BSE's Water Quality Lab over the summer. During his time in the lab, Baldwin collected water samples from Claytor Lake to analyze total nutrients, to look out for the appearance of bacteria/E. coli, and filter for chlorophyll a. His sample analysis was beneficial to determining the overall health of the water and identifying potential issues for the future of the waterway.



MATTHEW SMITH

Matthew Smith, senior, also completed research in BSE's Water Quality Lab this summer. He received a well-rounded experience by working on various research projects. For the first part of the summer, Smith maintained lab operations and work together with fellow BSE student Colin Baldwin (mentioned above) with bacteria analysis. During the second half of the semester, he worked with Jactone Ogejo, associate professor of biological systems engineering and extension specialist, on his Organic Resource Manager and researched ways to repurpose food waste into cattle feed. Additionally, he worked on hydropower health assessments with Ryan Calder, assistant professor of environmental health and policy in the Department of Population Health Sciences



Summer Travel Experiences



Olivia Basco and Nicole Chapman, seniors and BSE Ambassadors, were both traveling abroad this summer and they had the opportunity to enjoy the sunset together at the Palace of Versailles. Olivia Basco, BSE and French double major, took classes at Alliance Française de Paris in Paris, France. Her travels to France were supported by the Jocelyne Couture-Nowak Memorial Scholarship, a merit-based scholarship for French majors established in memory of Jocelyne Couture-Nowak, who died during the tragic shooting at Virginia Tech on April 16, 2007. Couture-Nowak was a faculty member in the Department of Foreign Languages and Literatures. She touched and inspired many students to continue studying French.

“This trip helped me become closer to my goals of moving to Paris after college and continuing vaccine development for a year before applying to medical school.”
Olivia Basco

Chapman, a BSE and French double major as well, traveled to Germany to study the sport horse industry! She toured breeding facilities, observed equine performance testing, and learned from experts in international equine transportation, architecture, footing, and training. She also studied equine history, equipment, behavior, nutrition, and human/horse biomechanics. Chapman ended up riding at Landgestüt Redefin (State Stud Redefin) and receiving a Class 5 Small Bronze Medal, an accomplishment that is part of the German medal system, which enables students to progress to professional status.



Alex Lowe, BSE ambassador and senior, (photographed left with owl and porcupine) and Kyle Lowe, senior, (photographed right with snake and owl) worked in Kathleen Alexander's lab in Botswana over the summer following their semester abroad at the University College Dublin in Ireland. In Alexander's lab, they organized sample data into relational databases, collected samples in field, and fed rescue animals that live at the Caracal Biodiversity Center. Alexander is a professor in the Department of Wildlife and Fish Conservation at Virginia Tech.

Summer Travel Experiences



Rachel Wulf-Smith, senior, (right in first photo), collected data on experimental reforestation plots at the Fundación Para La Conservación De Los Andes Tropicales (FCAT) field station in Ecuador this summer. Smith's work was a continuation of the undergraduate research she completed this past year for the Virginia Tech Restoration Ecology Lab with Leighton Reid, assistant professor in the School of Plant and Environmental Sciences, (left) on designing more efficient ways to re-establish biodiversity in degraded landscapes. In the first photo, Smith and Reid are photographed overlooking the FCAT reforestation sites near Quininde, Ecuador. The next photo is of Smith measuring and checking viability of a Balsa seedling in one of the experimental reforestation plots. In the final photo, Smith is seen in the trees at an old growth forest.



Gavriel Cambridge, junior, spent a month working in the jungles of Belize on a jaguar population survey with Marcella Kelly, professor in the Department of Fish and Wildlife Conservation. Cambridge helped develop wildlife cameras and set up custom-made camera traps to capture high quality images of wildlife.

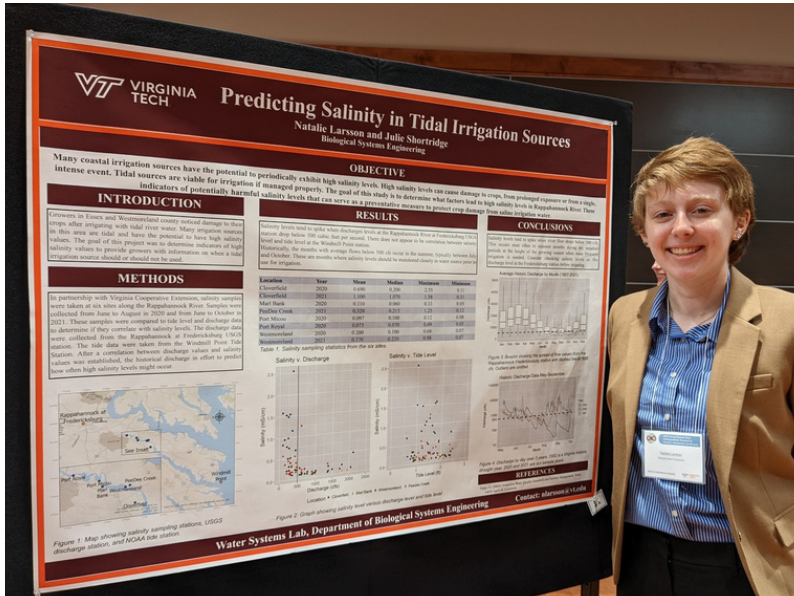
Risa Dickerman '22 (left, center left) and Sarah Taylor, senior, (center right, right) studied brewing technology at the Technical University of Munich's Weihenstephan campus in Freising, Germany.



Undergraduate Student News

Natalie Larsson, senior, presented her research poster titled "Predicting Salinity in Tidal Irrigation Sources" at the 2022 Dennis Dean Undergraduate Research and Creative Scholarship Conference. The conference included displays from 281 Virginia Tech college students representing eight of the college's schools and eight local high school students. The conference is named after Dennis Dean, professor of biochemistry, former director of the Fralin Life Sciences Institute, University Distinguished Professor, and longtime supporter of undergraduate research. "The undergraduate research conference allowed me to discuss my research with different audiences. There were a lot of people there, from parents to other students to department heads," Larsson said.

"This gave me the opportunity to practice discussing my research in different levels of detail to different types of people, which was good practice for scientific communication. The poster presentation section is a lot like a science fair. People walk around between posters, so you're only talking with a handful of people at a time. You also have the opportunity to listen to other students' presentations, and I was able to learn a lot while presenting my own research."



Nicole Chapman, senior, was recognized for winning the 2022 Robert E. Stewart Engineering-Humanities Award at the ASABE Annual International Meeting in July in Houston, Texas. She was selected for this award because of her outstanding academic record and her dedication to promoting agricultural and biological engineering all while pursuing a dual degree in French and serving the department as a BSE Ambassador.

SENIOR SPOTLIGHT



Drew Thomas Brewster, Spring 2022 graduate, from Denton, Maryland focused on our Food Engineering track in our department and minored in Food Science and Technology. After graduation, Brewster joined the workforce and started his employment at AstraZeneca.

Undergraduate Student News



In BSE, we don't just dip our toes in the water, we step right in! BSE seniors Grace Whitesell (left) and Julia Post (right) are seen working on a stream flow lab near Duck Pond during their Field Methods in Hydrology (BSE 4224) class this semester.



BSE seniors Isabella Munson (front right), Julia Post (front left), Julia Bruneau (back left), and Kelly Houck (back right) were in Amherst County, Virginia for their senior design site visit. For their project, they have to come up with a design for a pedestrian bridge along the Appalachian Trail crossing Brown Mountain Creek South.

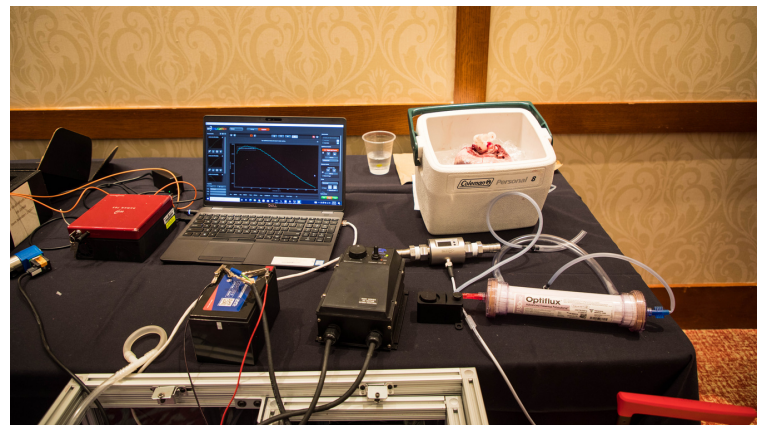


BSE juniors, Henry Presman (left) and Julia Post (center) and Civil Engineering graduate student, Morgan Oehler (right), enjoyed Stiles Fall as their classroom for Applied Fluvial Geomorphology (BSE 4324). During this field trip, students identified and discussed different stream classifications.

SENIOR SPOTLIGHT



Sophie Bosse, Spring 2022 graduate, from Purcellville, Virginia focused on our Watershed Science & Engineering track in our department and minored in Green Engineering. Bosse is now working as a Water Resource Engineer with Wood PLC in Nashville, Tennessee.



The September/October 2022 issue of ASABE's Resource Magazine features our top three senior design teams from the Spring 2022 semester on page 15 and it's available online to read!

[Read the ASABE Resource Magazine](#)



In their Synthetic Biology class, BSE juniors Shashwat Dhanuka (top row, far left), Johnathan Bailey (second from left), and Lili Zeblium (top row, far right), and Mechanical Engineering student, Hajar Chokhmane (top row, second from right) prepped samples for Gel Electrophoresis, a lab method used to separate mixtures of DNA, RNA, or proteins according to molecular size. The class is taught by Clay Wright, assistant professor of biological systems engineering (pipetting in center, turning on equipment in bottom).

In October, our student chapter of ASABE hosted a pumpkin carving and painting event to build community among our students. Check out these awesome designs! In the top photo, BSE seniors Lindsey Stamenkovich (left), Iveth Cruz (second from left), Julia Post (second from right), and Lexi Warren (right) proudly display their pumpkin creations. In the bottom left photo, BSE juniors Lili Zeblium (left) and Shashwat Dhanuka (right) show off their painted pumpkins. In the center photo, we see Warren's pumpkin on display. In the bottom right photo, the Virginia Tech ASABE Student Chapter President and BSE senior, holds up his pumpkin masterpiece.



We're excited to welcome transfer students Johnathan Bailey (seen on left in first photo, center in second photo), April Sayers (center, right), and Georgie Sawyer (right, left) to the department. For National Transfer Student Week, the group enjoyed lunch overseeing Lane Stadium with our advisor, Priscilla Baker, (not photographed) in the President's Box.

SENIOR SPOTLIGHT

Robert Walters, Spring 2022 graduate, from Woodbridge, Virginia focused on our Environmental Health pathway in our department. Now, he's working in the Stormwater Division for York County Public Works.



Undergraduate & Graduate Student News

In the summer, Diana Schmidt, master's student, (left) and Ellie Bueher, junior, (right) went into Smokehole Cave, with assistance from the Virginia Tech Cave Club and Virginia Department of Conservation and Recreation staff members, to investigate the fate and transport of *E. coli* through cave and karst systems with water-quality implications for roadside springs used for drinking water. This project was funded by The Cave Conservancy of the Virginias to Jonathan Czuba, assistant professor of biological systems engineering, and Leigh-Anne Krometis, associate professor of biological systems engineering and Turner Faculty Fellow.



Sarah Price, master's student, (left) and Jett Katayama, senior, (right) collaborated with Erin Ling, BSE water quality extension associate, (not photographed), on a watershed project demonstration for Summer Enrichment Experience (SEE) campers, gifted middle schoolers from rural counties in Appalachia. Thirty-nine campers learned about the water cycle, ground and surface water, and drinking water sources.

Katie Wardinski, doctoral student, was recognized by the Society for Freshwater Science as the graduate student runner-up in the basic science category for her presentation at the Joint Aquatic Sciences Meeting held May 14-20 in Grand Rapids, Michigan.



Graduate Student News



Earlier this summer, Beth Prior (right in first photo) and Daniel Smith (left in first photo), doctoral students, participated in the National Science Foundation (NSF) International Research Experience for Students (IRES) Program for Graduate Training in Advanced Techniques for Water Management in the Netherlands. The program focused on introducing students from the United States to Dutch water management strategies, best practices, nature-based solutions for flooding, and other water issues. The cohort visited many sites that had significance to water: historical places relevant to the massive 1953 Dutch flood, mudflats, estuaries, the largest wave flume in the world, and the sand engine, which is one of the largest sand nourishments in the world! The cohort also spent a lot of time at Deltares, a major Dutch international water consultancy, learning how to use their state of the art software, Delft3D, for hydrodynamic and morphodynamic modeling of waves, estuaries, deltas, and rivers.



Daniel Smith successfully defended his doctoral research "Do Roots Bind Soil? Comparing the Physical and Biological Role of Plant Roots in Streambank Fluvial Erosion" in August. Smith's advisor was Tess Thompson, associate professor of biological systems engineering. This semester, he started a post-doctoral position with Brian Badgley, associate professor in the Virginia Tech School of Plant and Environmental Sciences.



Graduate Student News

DIANA SCHMIDT

Diana Schmidt, master's student, interned with the USDA Natural Resources Conservation Service in Glenwood Springs, Colorado this summer. Schmidt assisted with surveying and designing a variety of irrigation management and water conservation projects on the western slope of the Colorado Rockies.



ROJA KEVAH GARNA

This semester, Roja Kevah Garna successfully defended her thesis "Improving Watershed Models to Achieve a Better Prediction of Water Quantity and Quality" and received her Ph.D. Her advisor was Zachary Easton, professor of biological systems engineering and extension specialist.



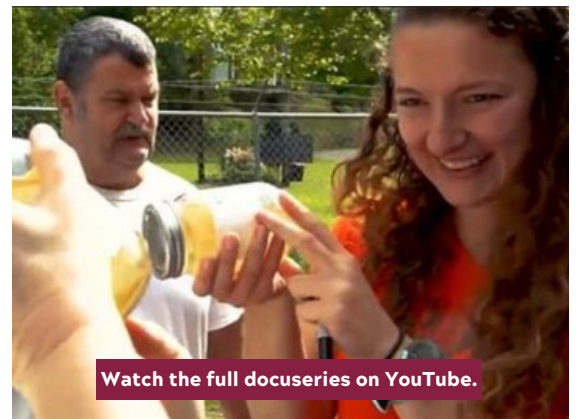
SUMAIYA

This semester, Sumaiya successfully defended her thesis "River-Floodplain Connectivity and Sediment Transport Potential: Applications to Sediment Dynamics on Floodplains and Juvenile Freshwater Mussel Settling in Rivers" and received her Ph.D. Her advisor was Jonathan Czuba, assistant professor of biological systems engineering.



HANNAH PATTON

Hannah Patton, doctoral student, was featured in a Water Docuseries by the U.S. Water Study Research Team. Patton admits that her graduate research doesn't always go as planned. But when it brings her face-to-face with concerned citizens, her research can help do good – even if that just means listening and providing results on a small scale. Patton is advised by Leigh-Anne Krometis, associate professor of biological systems engineering and Turner Faculty Fellow.



Watch the full docuseries on YouTube.

Graduate Student News

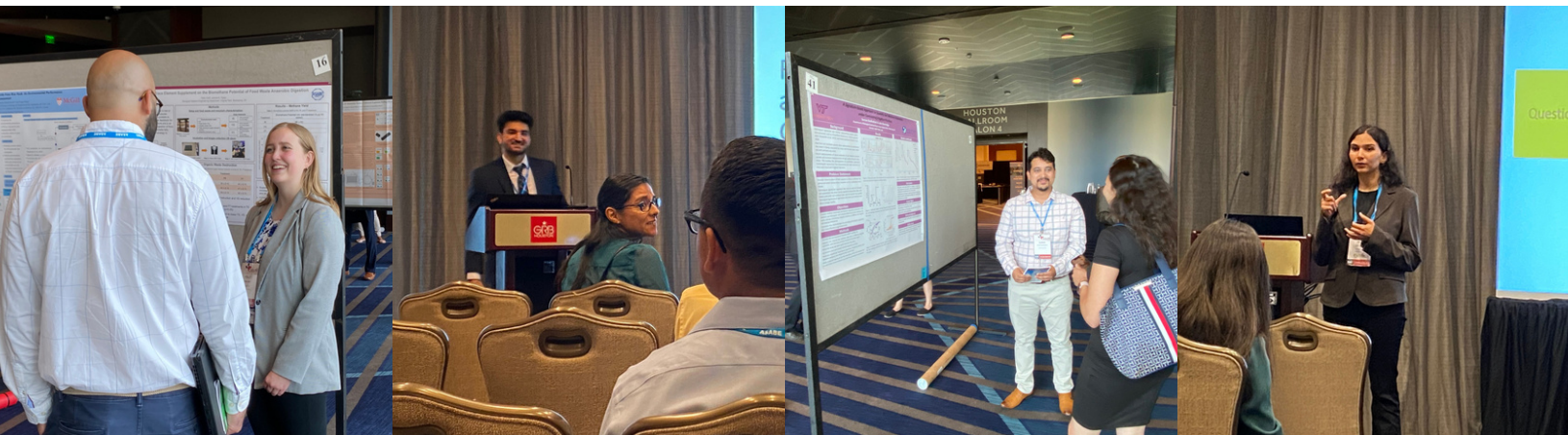


Leigh-Anne Krometis, associate professor of biological systems engineering and Turner Faculty Fellow, Erin Ling, BSE water quality extension associate, and Kathleen Hohweiler and Sarah Price, master's students, and Hannah Patton and Charles Sterling, doctoral students, presented their presentation "What's in Your Water? Building Trust in Tap Water" at the 2022 Virginia Health Catalyst Annual Summit.

In early November, BSE faculty members, graduate students, and undergraduate students traveled to Raleigh, North Carolina to attend the Tri State 2022 ASABE State Section Meeting hosted by the NC State Department of Biological and Agricultural Engineering.



Biological and agricultural engineers from North Carolina, Virginia, and South Carolina all came together to discuss building resilient biological systems in the Southeastern U.S. BSE doctoral students, Hoda Hammad (bottom left) and Rana Genedy (bottom right) won awards from the 3-minute-thesis competition at the meeting. Hammad tied for third in the Agriculture Food & Energy category for her thesis "Can we Bring Life into Materials: Engineered Living Materials". Genedy won first in the Environmental Quality category with her thesis "Machine learning-based model to inform decisions to minimize ammonia loss from dairy farms."



Kelly Graff, master's student, (far left); Laljeet Sangha, doctoral student, (second from left); Suman Budhathoki, doctoral student, (second from right); and Rana Genedy, doctoral student, (far right) presented on their various research at the ASABE Annual International Meeting in July in Houston, Texas.

BSE Ice Cream Social



On Thursday, August 25, 2022, we hosted our third annual Fall Ice Cream Social! Faculty, staff, undergraduate and graduate students, and a few BSE alumni attended the event to mingle with others within the BSE community, play cornhole, enjoy the beautiful weather, hear from representatives of our BSE student groups (VT ASABE, Alpha Epsilon, and the BSE Graduate Student Organization), and, obviously, to eat great ice cream from Homestead Creamery. We wrapped up the event with a raffle for our community to win various BSE swag items. Everyone had a blast and we look forward to hosting this event again next year!

Want to see more photos? Check out our Facebook photo album!



ALUMNI NEWS



COLLEGE OF ENGINEERING INDUCTS FIVE MEMBERS INTO VIRGINIA TECH ACADEMY OF ENGINEERING EXCELLENCE

Virginia Tech's College of Engineering recently inducted five members into the Academy of Engineering Excellence. The 2022 inductees were selected from the more than 74,000 living Virginia Tech engineering alumni and brings the academy to a total of 173 members. Academy members have made sustained contributions in engineering and leadership throughout their accomplished careers. One of this year's inductees is Edmund Y.S. Chao, an alumnus of our program.

Chao received his Master of Science in agricultural engineering in 1964. Throughout his time at Virginia Tech, Chao split his coursework between mechanical and civil engineering. The resulting cross-disciplinary learning and problem-solving skills he obtained from those courses led him to a career in the recently emerged discipline of biomedical engineering.

"The strong engineering and math training strengthened my ability to solve agricultural problems, which set the foundation for me to go into human mechanics, thus helping create a new discipline bridging mechanics and medicine/surgery," Chao said.

Throughout his career, Chao has made significant contributions in the basic understanding of musculoskeletal joint mechanics, bone fracture fixation and repair, and artificial joint replacement in the hip, knee, and shoulder. Chao currently serves as a visiting professor at Xi'an Red Cross Hospital and Yen'an University School of Medicine in China.

VIRGINIA TECH ALUMNUS EARNS NATIONAL RECOGNITION AS SOUTHEASTERN FARMER OF THE YEAR

Virginia Tech alumnus Robert Saunders (third from left) has been named the 2022 Swisher/Sunbelt Southeastern Farmer of the Year. Saunders is the general manager of Saunders Brothers Inc., a multi-generational farm in Piney River, Virginia, that he operates along with his brothers and fellow Hokies (from left) Jim '85, Bennett '83, and Tom '81.

They grow woody ornamentals, annuals, perennials, boxwood, grafted trees, peaches, nectarines, apples, and Asian pears on their farm.

The Saunders family's most recent accolade was announced last week at the Sunbelt Ag Expo in Moultrie, Georgia, where Robert Saunders represented Saunders Brothers and the Commonwealth of Virginia as the 2022 Virginia Farmer of the Year. Robert Saunders is just the fifth Virginia farmer to earn the Swisher/Sunbelt Expo Southeastern Farmer of the Year recognition. The Saunders Brothers farm has roots that are deep at Virginia Tech. The university has issued degrees to 36 of Robert and Pat's family members including brothers, sisters, nephews, and nieces. Also, Saunders Brothers currently has five other Hokies as a part of their team in sales and production.

"On behalf of the entire Saunders family, I am both honored and humbled to be named the Southeastern Farmer of the Year," said Saunders, who graduated from the university in 1986 with a degree in agricultural engineering. "The success of the farm would not be possible without our dedicated employees and the community members who have supported us from day one."



Both articles are available to read on our website in our Newsroom.

ALUMNI NEWS



Lindsay Platt '15 is pursuing a Master's in Freshwater and Marine Science at University of Wisconsin-Madison's Center for Limnology and we loved her first day of school photo. We always enjoy seeing what our alumni are up to after they graduate from our department. Best of luck to you, Lindsay!



Haley Fuller '15 successfully defended her dissertation titled "Robotics and Automation in Cardiovascular-Inspired Platforms for Bioengineering" and received her Ph.D. in Bioengineering from University of Pittsburgh. Congratulations, Dr. Fuller!



Laura Sholder '21 is now working for Adaptimmune as a Manufacturing Cell Therapy Associate in Philadelphia, Pennsylvania. Sholder is from Montville, New Jersey and she focused on our Biotechnology track and minored in Biomedical Engineering during her time at Virginia Tech. Congratulations on this amazing job shift!



Thank you Antonio De Cecco '19 for coming to campus to meet with our students to discuss career opportunities at WithersRavenel, a full-service civil and environmental engineering firm serving both the private and public sectors. At WithersRavenel, he is a Wastewater Staff Professional.



Thank you Ben Johnson '07, M.S. '09 for meeting with our students to share the career opportunities that await them at DSM, a global purpose-led, science-based company specializing in Nutrition, Health & Sustainable Living. Johnson also gave a seminar this semester on Bioprocessing in Industry. At DSM, Johnson is a Downstream Processing, Advanced Analytics, and Modeling Team Lead.

EXTENSION NEWS



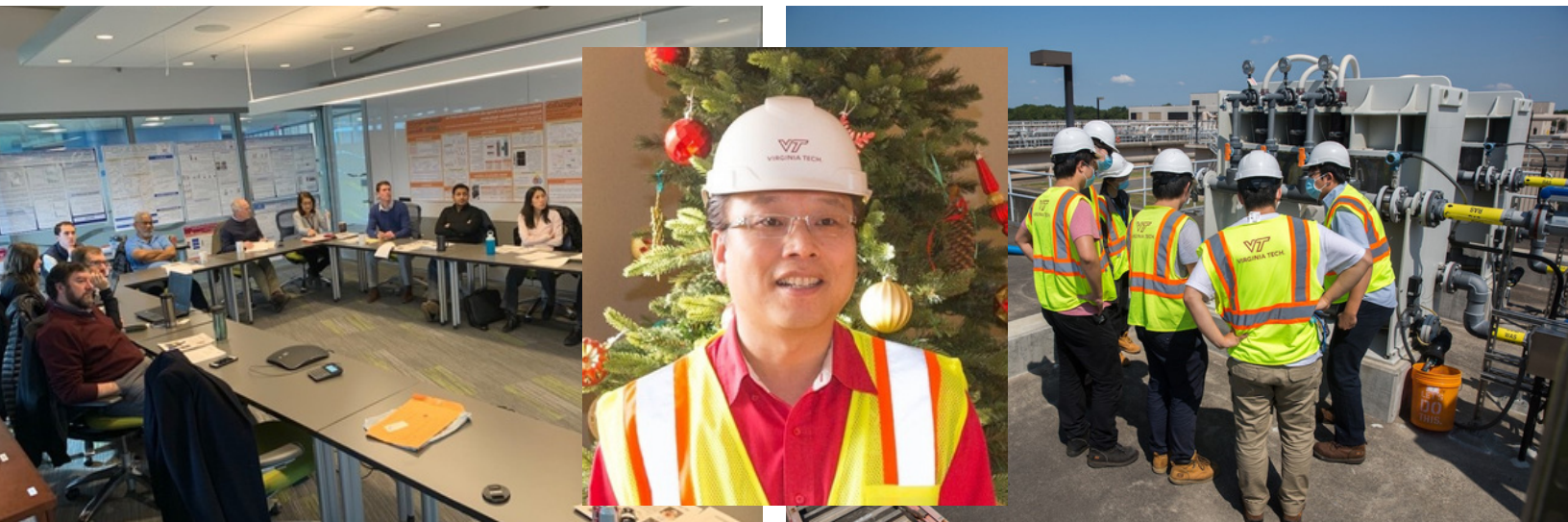
David Sample is a professor and extension specialist in our department and he leads the Urban Stormwater Management Program. The objectives of his extension program are to increase awareness of the impacts of urban stormwater and available stormwater control measures (SCMs), also known as best management practices (BMPs); to advance the technical capabilities of professionals engaged in designing and implementing SCMs; and to facilitate the evaluation and implementation of new stormwater treatment technologies. To address his first extension objective, Sample published 16 peer-reviewed Virginia Cooperative Extension (VCE) fact sheets on the SCMs currently approved for use in the Commonwealth of Virginia; this entire series was just updated and republished by VCE. These activities provide knowledge about improved stormwater practices needed to help Virginia meet its water quality goals.

In order to tackle his second extension objective, Sample went on to develop and conduct four workshops from 2015-2018, two in Virginia, one in Chicago, Illinois, and another in Shenzhen, China, on stormwater modeling using the U.S. EPA's Stormwater Management Model (SWMM). These workshops provided valuable teaching experience for graduate students in his program. One of the attendees was inspired by what he learned and decided to use SWMM-based watershed models for drainage and water quality planning. Sample has also developed and delivered numerous workshops for professionals, on general aspects of urban stormwater management. Many of these workshops highlighted SCM implementation projects. Sample is one of the instructors for the Urban Nutrient Management (UNM) Planner Certification Program administered through a partnership between the Virginia Department of Conservation and Recreation (VDNR) and VCE. Training in soil science, fertilizer application, irrigation, plant health, and plan writing is provided.

He's led training on urban stormwater and water quality, which helps meet the reduction goals required by the Chesapeake Bay Total Maximum Daily Load (TMDL). These plans protect water quality by reducing fertilizer use while maintaining the health of the landscape, the core elements of the UNM training. UNM plans provide a simple means of calculating anticipated water quality benefits, allowing municipal stormwater programs to focus their restoration efforts in other areas, freeing up resources that can target other pressing issues that can now be addressed with greater efficiency. To provide this training, the "Handbook of Urban Nutrient Management" was developed and published by VCE. Sample authored the stormwater chapter of the Handbook, which, in combination with the aforementioned fact sheet series, formed the basis for the text of the Chesapeake Bay Landscape Professionals Program. This is a voluntary certification for landscape professionals that design, install, and maintain sustainable landscapes to improve water quality. This document was published as a regional document by Maryland Cooperative Extension, extending the benefits of UNM to the entire Mid-Atlantic region.

Finally, to achieve his goal of facilitating the evaluation and implementation of new stormwater treatment technologies, Sample led and participated in several efforts to create a testing and evaluation program for new, proprietary technologies used in SCMs, known as manufactured treatment devices (MTDs). This included leading a group of experts and developing a draft protocol that defined how MTDs would be tested, evaluated, and assigned a water quality treatment credit. Subsequently, he led a workshop on a Bay wide evaluation program and participated in a Chesapeake Bay Trust-funded effort that assessed whether to develop a Bay wide program or join the Stormwater Testing and Evaluation for Products and Practices (STEPP) initiative of the Water Environment Federation, a national effort. According to a lead municipal stormwater engineer, this evaluation program would be extremely beneficial in assuring that MTDs perform and municipalities can rely on them to provide water quality treatment.

EXTENSION NEWS



As a professional engineer specializing in biological wastewater treatment, Zhiwu “Drew” Wang’s extension program focuses on application-oriented technological innovation aiming to address the pressing needs of environmental protection, energy sustainability, and food security for improving the quality of all human life. His extension program, the Water Resource Recovery Biotechnology Program, has been implemented through the Virginia Tech Center for Applied Water Research and Innovation (CAWRI) under his leadership. CAWRI aims to provide a platform for industrial-funded projects focusing on applied water research and to strengthen the collaboration between Virginia Tech and the water industry. For many years, Virginia Tech has been a leader in water research, participating hand-in-hand with the water industry in order to solve challenges that the industry faces. CAWRI was created as a way to more directly address the needs of the water industry in a timely manner. Under the leadership of Wang, it has been an incredibly beneficial partnership for both the water industry and Virginia Tech.

CAWRI takes advantage of the research strength on Virginia Tech’s campus to advance water research to address questions at the nexus of resource, water, and energy. The water industry is constantly evolving due to changes in regulations, input from stakeholders, and an interest in treating water more efficiently to reduce our environmental and financial impacts. Water has always been a space where innovation has been pursued and implemented, meaning that there are always opportunities to support and conduct research and improve water and wastewater treatment systems. CAWRI is a place where utilities and other industry partners can come together to investigate issues they are currently experiencing at their facilities or to get a better understanding of the impacts of future innovation on their treatment processes. The value of this connection between the water industry and Virginia Tech is the real-time direct access to researchers who study real-world issues, most of the time using actual samples provided by the utilities.

Since its inception in 2016, CAWRI has received \$2 million in research grants from the water industry and, either directly or indirectly, supported the research projects of 19 graduate students who are becoming the next generation of leaders in the water industry as well as produced over 50 peer-reviewed journal papers and 100 oral presentations or posters in regional and national conferences, from which a number of prestigious awards have been received. This level of activity raises Virginia Tech’s profile as a leader in the water sector, which in turn has resulted in over \$1 million of funding support from federal agencies such as the National Science Foundation, Department of Energy, United States Department of Agriculture, and Department of Defense for water and wastewater research in Wang’s laboratory.

FACULTY + STAFF NEWS

Virginia Tech team works to address legacy nutrient issues affecting water quality



The Virginia Tech team will pilot an innovative treatment technology on a spring in the Shenandoah Valley. The U.S. Geological Survey estimates that this spring discharges almost 900,000 gallons of water per day. Photo by Kurt Stephenson for Virginia Tech.

Excess nutrients in water can affect human health, the environment, and the economy, costing federal, state, and local governments billions of dollars per year to minimize the impacts. In order to evaluate and measure nitrogen – one of the key nutrients – a group of scientists from Virginia Tech is developing and evaluating nitrogen removal programs at a test site in Virginia. The team, which is made up researchers from the Department of Agricultural and Applied Economics and others at the university, is investigating options for "pay for demonstrated performance" programs that compensate agricultural landowners for nutrient reduction removal success in local water systems. This program would create incentives to manage bioreactors to maximize removal performance. The four-year project is funded by a \$499,627 grant from the U.S. Department of Agriculture.

Harmful algal blooms, dead zones, and fish kills are the result of eutrophication, which begins with the increased load of nutrients to fresh and coastal waters. An important source of nitrogen is historical applications of fertilizers and manures, called legacy nitrogen. This nitrogen leaches through soils and into groundwater. Legacy nitrogen may have been stored in groundwater aquifers for decades before being discharged in springs. Although the water is clear from the Shenandoah Valley spring where the team is working, it contains relatively high levels of nitrate. The levels are not high enough to be of concern for human health, but the nitrogen does contribute to eutrophication, most notably the Chesapeake Bay.

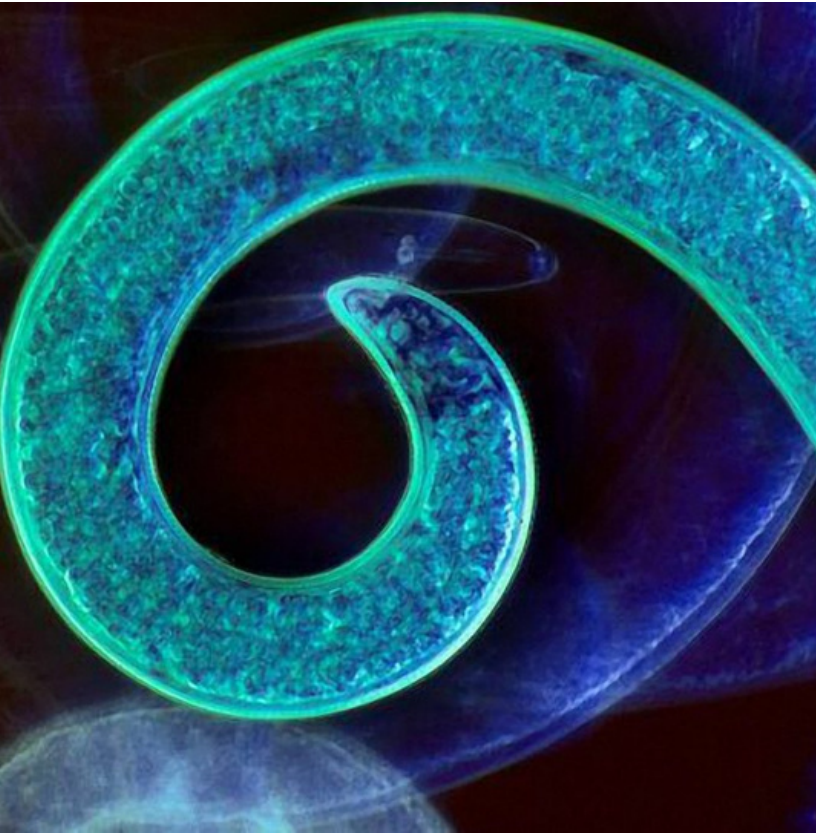
One of the few technologies available to treat legacy nitrogen is using bioreactors to remove the nitrogen from the water by chemical reduction. Bioreactors are lined beds filled with carbon material, typically wood chips. The carbon provides energy to microbes that convert nitrates into dinitrogen gas, which is biologically unavailable for plant growth.

Zachary Easton, co-principal investigator of the project, professor, and Virginia Cooperative Extension specialist, as well as Ph.D. student Elyce Buell of the Department of Biological Systems Engineering's eLAB are measuring the flow and water chemistry in and out of the bioreactor and testing management alterations to optimize nitrogen removal. The preliminary analysis shows the bioreactor removes about 20 to 30 percent of the nitrogen that flows into it.

Bioreactors have two advantages. First, nitrogen removal performance can be directly observed by measuring flow in and out of the bioreactor and sampling the amount of nitrogen in that water. Second, the per unit removal costs are relatively low. So the question becomes how to get agricultural landowners interested in installing bioreactors on their properties with water sources. Traditional incentives require the landowners to pay upward of 75 percent of the cost of installation. Since bioreactors have high up-front costs and provide the landowner with no other benefits, few are willing to make the investment.

Read the full story in our Newsroom on our website.

FACULTY + STAFF NEWS



VIRGINIA TECH RESEARCHERS USE ARTIFICIAL INTELLIGENCE TO COMBAT SOYBEAN NEMATODES

Lurking beneath the soil is something unseen by the naked eye, something so small you need a microscope just to catch a glimpse: nematodes.

The tiny organisms are ubiquitous in Earth's ecosystems and found on the tallest mountains to the darkest corners of the oceans. Often called roundworms, nematodes vastly outnumber other organisms on Earth. Some species of nematodes, however, can cause problems when present in excessive numbers.

Researchers in the Virginia Tech College of Agriculture and Life Sciences are studying how to use artificial intelligence to identify the presence of plant-parasitic soybean nematodes that cause upward of \$1 billion worth of soybean loss each year in the United States.

As part of the research, a robust microscopic data set of soybean nematodes will be developed as well as artificial intelligence algorithms for identification and geographic information system infestation heatmaps. The result of the research is packaging all of this into an executable tool for growers.

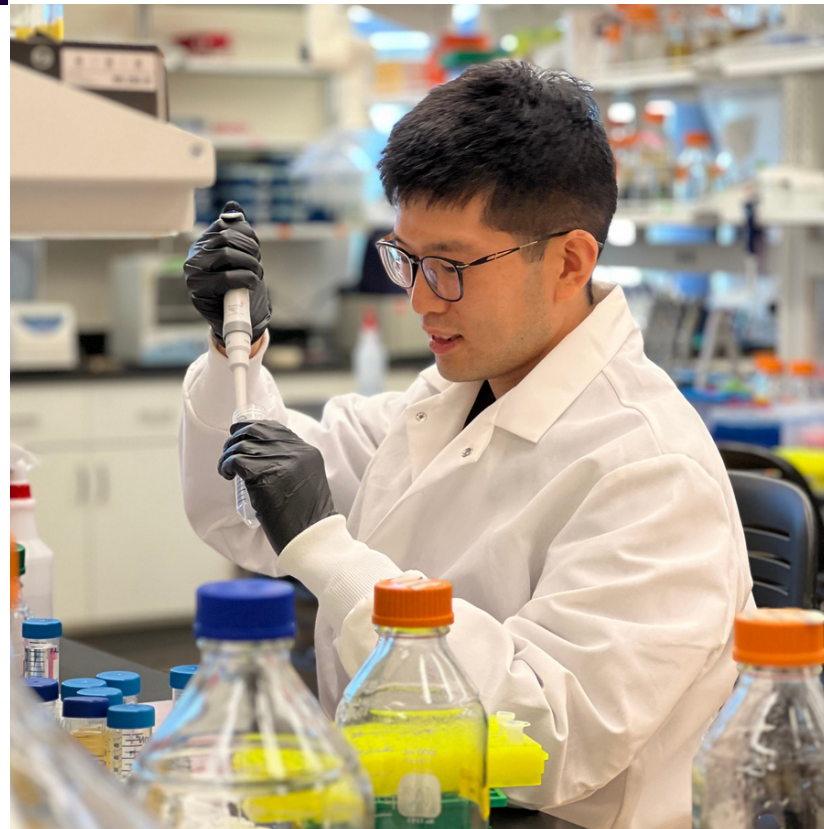
"This is a problem we're trying to solve on two fronts," said Abhilash Chandel, an assistant professor in the Department of Biological Systems Engineering. "The increased capacity of that manual counting and identification is one task. The other is tackling issues at the field level, which includes infestation levels of nematodes using large-scale satellite images or drone images."

VIRGINIA TECH RESEARCHER RECEIVES \$1.9 MILLION NIH GRANT TO DEVELOP NOVEL APPROACHES TO DIAGNOSE AND TREAT SEPSIS

Sepsis is a severe and life-threatening condition caused by bacterial infection and is one of the most common causes of death in hospitalized patients. Nearly 1.7 million adults in the U.S. develop sepsis, and a quarter of that number die from the infection, according to the National Institute of General Medical Sciences. Some infections cannot be resolved by general antibiotics because of strains of bacteria mutating, making it a challenge to provide adequate treatment.

Juhong Chen, assistant professor of biological systems engineering in the College of Agriculture and Life Sciences and College of Engineering, recently received a National Institutes of Health (NIH) grant to develop novel phage- and CRISPR-based approaches to detect and treat sepsis, including hybrid bio-inorganic nanobots, CRISPR-based devices, and CRISPR-quipped engineered phages. Chen and his research group also aim to address challenges for the detection of sepsis-related pathogens in blood samples. Chen's research could lead to formulating a revolutionary strategy to diagnose sepsis in blood samples in the future.

The five-year, \$1.9 million award is part of the NIH's Maximizing Investigators' Research Award for Early State Investigators program. This is given to faculty researchers who have demonstrated foundational biomedical technologies, such as prototype devices and applications, that could advance important medical breakthroughs.



Both articles are available to read on our website in our Newsroom.

New and Emeriti Faculty



Zhiwu "Drew" Wang, assistant professor, joined our department in August 2022. Following his education at the Harbin Institute of Technology in China and Nanyang Technological University in Singapore, Wang completed postdoctoral fellowships at Washington State University and Oak Ridge National Laboratory. After four years at Ohio State University as a Visiting Assistant Professor and Director of the Renewable Energy Program, Wang joined Virginia Tech's Civil and Environmental Engineering Department as an Assistant Professor. Wang has established a highly active and successful research program and, in addition to his other duties, serves as Director of the Center for Applied Water Research and Innovation.



Feras Batarseh joined our department in September 2022 in an associate professor position with research and teaching responsibilities in the area of Cyberbiosecurity. This position represents a collaboration between the College of Agriculture and Life Sciences and the Commonwealth Cyber Initiative (CCI). While Batarseh is stationed at CCI in Arlington, our department is his tenure home. We look forward to Batarseh's collaboration on exciting new research partnerships, his participation in the teaching mission, and his service on advisory and other committees.



Azahar Ali joined our department as an affiliate assistant professor. Ali is currently an assistant professor in the School of Animal Sciences and his research, teaching efforts, and interests are focused in the areas of Food and Bioprocess Engineering. His formal education includes a B.S. in Physics and an M.S. in Electronics Science from Guahati University in India, an M.S. in Bioelectronics from Tezpur University in India, and a Ph.D. in Biomedical Engineering from the Indian Institute of Technology. He has postdoctoral experience in the Department of Electrical and Computer Engineering at Iowa State University and the Department of Mechanical Engineering at Carnegie Mellon University, and he was a visiting researcher at the Hillman Cancer Center of the University of Pittsburgh Medical Center.



MARY LEIGH WOLFE HONORED WITH EMERITA STATUS

Mary Leigh Wolfe, professor and former head of the Department of Biological Systems Engineering in the College of Agriculture and Life Sciences and College of Engineering at Virginia Tech, has been conferred the title of professor emerita by the Virginia Tech Board of Visitors.

The emerita title may be conferred on retired professors, associate professors, and administrative officers who are specially recommended to the board by Virginia Tech President Tim Sands in recognition of exemplary service to the university. Wolfe retired in January 2021 after serving for almost 30 years. Nominated individuals who are approved by the board receive a copy of the resolution and a certificate of appreciation.

A member of the Virginia Tech community since 1992, Wolfe brought international attention to Virginia Tech through her work in nonpoint source pollution, the food-energy-water nexus, and engineering education. She has authored or co-authored more than 130 peer-reviewed journal articles, book chapters, conference papers, and reports.

In the classroom, Wolfe has taught both undergraduate and graduate courses and directed both master's degree and Ph.D. students. Wolfe received her bachelor's and master's degrees in agricultural engineering from Virginia Tech and her Ph.D. in agricultural engineering from the University of Minnesota.

Read the full story on our website in our BSE Newsroom.

Faculty Achievements



Abhilash Chandel, assistant professor of biological systems engineering, senior-authored a paper titled "Digitizing Crop Water Use with Data-Driven Approaches", which was published in the July/August edition of ASABE's Resource Magazine. [Read the full article in the magazine here.](#)



Leigh-Anne Krometis, associate professor of biological systems engineering and Turner Faculty Fellow, is the 2022 Recipient of the Universities Council on Water Resources Mid-Career Award for Applied Research, which recognizes outstanding early contributions in two important categories related to water: Applied Research and Extension, Outreach, & Engagement.



Mike Zhang, professor of biological systems engineering, received the 2022 VT CALS Applied Research Award, which is conferred to faculty members who have achieved significant and enduring contributions to science. [Read the full VTX article here.](#)

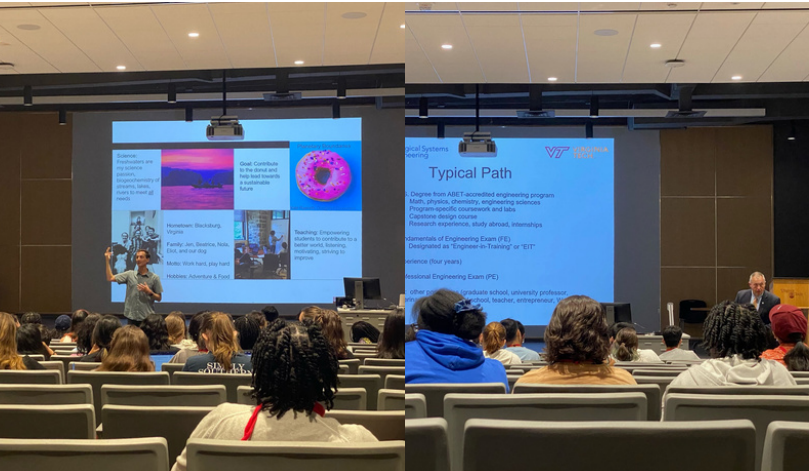


Jonathan Czuba, assistant professor of biological systems engineering, received a \$237,613 grant from the United States Geological Survey (USGS) to fund his research project "Advancing toward an operational method for measuring suspended sediment with downlooking acoustic Doppler current profiler."

The Virginia Tech Stream Research, Education and Management (StREAM) Lab is a unique, world-class research center focused on understanding the interactions of natural and human systems. Since receiving funding, the lab has been focused on restoring Stroubles Creek, which runs right through the heart of the Virginia Tech campus. [Watch the full video on VTX.](#)



Faculty Happenings and Accomplishments

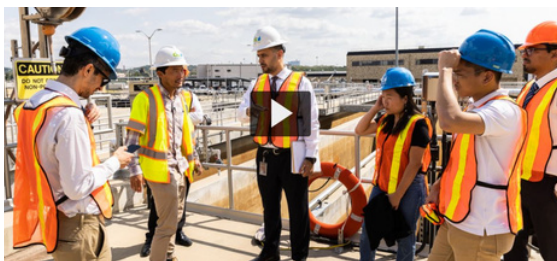


Durelle Scott, associate professor of biological systems engineering, (left) and Dwayne Edwards, BSE department head and professor, (right) presented at Virginia's Governor's School for Agriculture and talked with students about biological systems engineering and the different pathways we offer in our department.

Researchers from the Department of Biological Systems Engineering, Department of Civil Engineering and Environmental Engineering, and Virginia-Maryland College of Veterinary Medicine's Public Health Program took home awards from the 2022 WaterJAM Conference, put on by the Virginia Section of the American Waterworks Association (AWWA). Xueyao Zhang (second from right) and Hao Luo (far right), researchers in Zhiwu "Drew" Wang's lab won the wastewater and water categories respectively in the Fresh Ideas Poster Contest. Zhang also received the Virginia Water Environment Association (VWEA) Sonny Roden Graduate Scholarship. Wang (far left) is an assistant professor of Biological Systems Engineering.



The A3 Lab at Virginia Tech, led by Feras Batarseh, associate professor of biological systems engineering, (second from left) won first place in the Intelligent Water Systems competition at WEFTEC (the Water Environment Federation's Technical Exhibition and Conference). The research group developed an AI-based system for securing wastewater treatment facilities against cyber threats and supporting operator's decision making for water level predictions during extreme weather events.



Commonwealth Cyber Initiative partnered with DC Water to develop new methods that use AI models and data science technologies to protect against cyber threats, predict water flow and levels, and promote environmental safety.

[Watch the full video on VTX.](#)

Faculty Achievements & Donor Gratitude



Anna Duraj-Thatte, assistant professor of biological systems engineering, was selected as one of the winners of a 2022 EFO-Opportunity Seed Grant from Virginia Tech's Institute for Critical Technology and Applied Science (ICTAS). This grant will fund her project "Genetically Engineered Living Biosensors Empowered by Nanophotonics for Continuous and Selective Monitoring of Environmental Toxins."



Join us in congratulating Juhong Chen, assistant professor of biological systems engineering, for being selected as a winner of a 2022 EFO-Opportunity Seed Grant from Virginia Tech's Institute for Critical Technology and Applied Science (ICTAS). This grant will fund his project "A Smartphone-assisted Digital CRISPR (SPAdCRISPER) Device for the Rapid and Sensitive Detection of Emerging Viruses."



Tess Thompson, associate professor of biological systems engineering, received an EFO-Opportunity Seed Grant from Virginia Tech's Institute for Critical Technology and Applied Science (ICTAS). Thompson is the Co-PI for a project titled "New Instrumentation to Measure Sediment Properties for Predicting and Controlling Streambank and Coastal Marsh Erosion" with Mark Stremler, a professor in the Department of Biomedical Engineering and Mechanics.

From all of us in the Department of Biological Systems Engineering, we'd like to say thank you. We had 78 donors make gifts to BSE over the 2022 calendar year and we want to let you know that your generosity never goes unnoticed. Your support is critical to our department's growth. We encourage you to come back to campus to see the positive impact of your gifts!

Your contributions provide scholarships for students, enhance their learning experiences, improve our facilities and help us retain and attract eminent professors to the department. Gifts and donations can make a difference between a good and an excellent department. Giving is a critical component of keeping our department competitive with other top programs in the world. It doesn't take a lot to make a significant impact on the experiences of our students:

- A \$25 gift buys PPE for one student enrolled in our Unit Operations Laboratory.
- \$100 supports, prepares, and sponsors one of our students to take the Fundamentals of Engineering Exam, a notable first step in becoming a licensed professional engineer.
- \$500 funds the supplies and materials needed by one of our senior design teams to create innovative solutions to engineering challenges as part of their capstone course.
- \$1,000 will sponsor the incoming leadership of the student branch of ASABE at Virginia Tech to attend a national meeting to prepare for their upcoming officer duties.

You can make a gift to our department today by visiting our website at the link below or by participating in Virginia Tech's Giving Day 2023 campaign on February 15-16 from noon to noon.

WWW.BSE.VT.EDU/ABOUT/GIVING