

ENGEL HALL NEWS

LETTER FROM THE DEPARTMENT HEAD

Hello alumni and friends of Virginia Tech Biochemistry!

Glenda Gillaspay's tenure as head was an exciting time for the department, one in which we added a cadre of talented and creative young faculty, established a full-time advising office for our students, increased our research expenditures by a couple of million dollars, established new classes and updated established ones, and navigated the roiling waters of the Covid pandemic. However, all good things must come to an end, and this summer Glenda Gillaspay moved on to the University of Wisconsin, where she now serves as Dean of the College of Agriculture & Life Sciences. Although we are sad to see her go, we appreciate both the many contributions she made to our department as well as the magnitude of this opportunity. Please join me in wishing her well.

Although the Dean immediately authorized a national search for our next department head, someone needed to take the helm as this complex process worked itself out. Having served as department head previously (2005-2015), the Dean asked and I agreed to postpone my retirement and serve as interim department head. My first order of business was to address the shock that Glenda's departure had administered to our departmental psyche, particularly that of our younger faculty and graduate students. I knew in my heart that our department had made tremendous progress over the years and had weathered many storms, including budget cuts and a merger, and would weather this current one. But how was I going to make that feel real for the people in our department?

I made a PowerPoint slide showing a campus map from 1989, the year of my arrival, and another of present-day campus. The difference was dramatic. Since 1989, the university had constructed numerous buildings and established new facilities that either directly or indirectly served the needs of our faculty, students, and their collaborators:

1. The Fralin Center for Biotechnology, home to Virginia Tech's confocal microscope center, a BSL-3 lab, insectaries as well as the Dean, Sobrado, and Tu research groups.
2. Life Science-1, which for a time served as home for the Helm lab as well as the original home for the mass spectrometry incubator, which he helped establish, along with a state-of-the-art vivarium complete with BSL-3 rooms.
3. Latham Hall, home of the Gillaspay lab and cradle of the Translational Plant Science graduate program.
4. Steger Hall, current home for the Helm, Jutras, Lahondère, and Vinauger labs along with the mass spectrometry incubator and new glycobiology center, which Prof. Helm also oversees.

Not shown was the entire VT-Carillon Medical School and Biomedical Research Center in Roanoke, the new advanced computing facilities on campus, and the many renovated spaces inside Engel Hall including several research labs, a new student advising center, etc.

The message I spoke to the department that August morning I now proclaim to you, our alumni and friends:

We are a department on the rise!

The pages that follow document many of the ways in which our department has and will continue to advance to better serve our research, educational, and service missions. Please read, enjoy, and be proud!

As always, we thank you for your continued support, look forward to your calls and visits, and wish you a safe and happy holiday season!

Many thanks,

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ENGELPALOOZA

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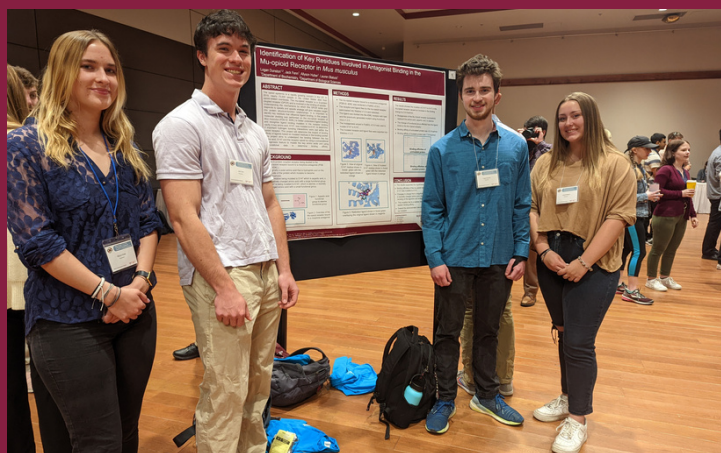
Follow us on social media for daily content, including announcements, event information, student features, departmental plans, and more!



UNDERGRADUATE STUDENT FEATURES

Introduction to Biochemistry Research Skills

Anne Brown, assistant professor of biochemistry, teaches Intro to Biochemical Research Skills, a course designed to provide a course-embedded undergraduate research experience (CURE) to freshmen students. Students work in small groups to use computational techniques like molecular docking and molecular visualization to understand the structure and function of important proteins in our society, like an opioid receptor, an antibiotic resistance protein, and an Alzheimer's drug target. In addition to learning fundamental knowledge of protein biochemistry, students learn how to effectively function as a research group, how to design an experiment, and how to report results and communicate their science. We use research as a theme throughout the course because the tenets of research (and the professional and workforce skills associated) are useful for any career path of our majors.



From left to right, Allyson Huber, Jack Fenn, Logan Dunston, and Lauren Blalock presented their poster titled "Identification of key residues involved in antagonist binding in the Mu-opioid Receptor in *Mus musculus*."

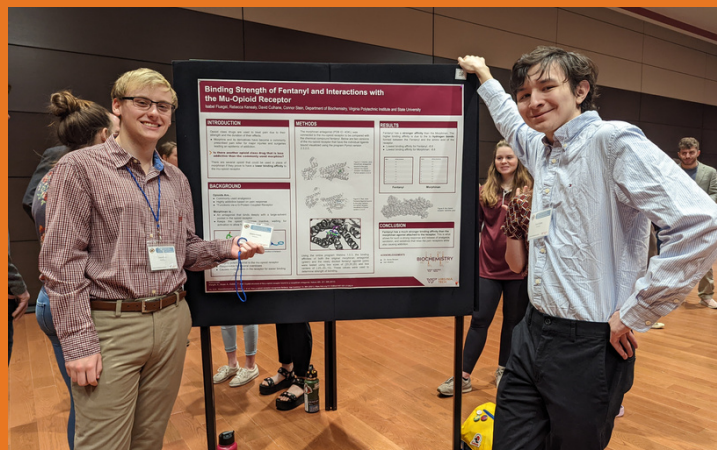
Here's a snippet of their abstract: The opioid epidemic is a rapidly growing concern in the US. In 2019, nearly 70,000 people in the United States died from opioid-related overdoses. The Mu-opioid receptor is a G-protein coupled receptor (GPCR) and is involved in the binding of opioids. Understanding the mechanisms by which this GPCR binds and responds to opioids and opioids analogs will give valuable insight into protein structure-function relationships

During the Spring 2022 semester, students worked in groups studying one of four protein targets to introduce the relationship between protein structure and function. Students used molecular visualization techniques to understand the overall structure of their proteins, and molecular docking to understand how small molecules can bind to their protein target. From there, students either mutate essential amino acids in their protein or compare how a different small molecule binds to the protein and can impact function. Students then present their group research projects at the Dennis Dean Undergraduate Research Symposium, allowing them to develop their ability to present and communicate science in a professional venue. Read more about these groups and their projects on pages 2 and 3.

Connor Stein (left) and David Culhane (right) presented their research studying the effect of ligand type on the binding affinity to the Mu-opioid receptor. The group also consisted of Isabel Fluegel (not pictured) and Rebecca Kenealy (not pictured).

Here's a snippet of their abstract:

Opioid class drugs bind the opioid receptors in the body and lessen feelings of pain. However the effectiveness of these drugs makes them both extremely valuable and dangerous due to the likelihood of addiction. The goal of this study is to examine the role different opioids have on binding affinity to mu opioid receptors. Investigating how pain relieving drugs bind to the pain receptors in the brain plays a major role in understanding drug mechanisms.



UNDERGRADUATE STUDENT FEATURES

Introduction to Biochemistry Research Skills



Sabrina Allen (left), Kaustubhram Wooputur (center), and Emma Argo (right) presented their research poster titled "Investigating the Effect of Size and Composition of Various Sugar Molecules on Binding Affinity to Glucokinase."

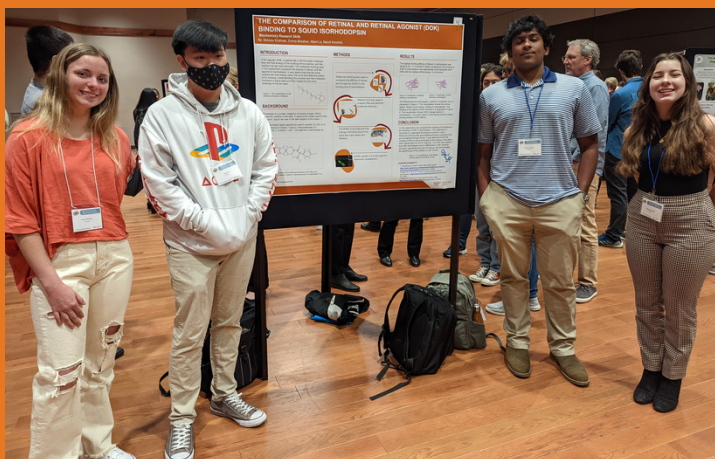
Here's a snippet of their abstract:

Glycolysis is a metabolic process that breaks down the different sugars you ingest to release energy and pyruvic acid to feed into the Krebs cycle. At the start of glycolysis, the enzyme glucokinase phosphorylates glucose into glucose-6-phosphate. The binding site of glucokinase is very small, which limits the size and, in turn, the molecular composition of the ligands that it is compatible with to modify. Additionally, the binding site of glucokinase favors smaller, less complex molecules, thus impacting compatibility. To better understand different sugar molecule ligand affinity for glucokinase, molecular docking was performed to analyze the binding affinities of three different molecules - glucose, glucose-6-phosphate, and sucrose.

From left to right, Cole Souders, Jacqueline Anthus, Zimmie Phillips, and Jacob Mason presented their research project "Utilization of Computational Techniques to Analyze the Effect of the Mutation of Residue S101 of the JAR-1 Protein Complex of Arabidopsis thaliana."

Here's a snippet of the group's abstract:

JAR-1 is a protein found in all plants that plays a key role in the stress response pathway by regulating growth inhibiting molecules and defensive compounds that assist with repairing damage. One of the key functions of JAR-1 is to catalyze the conjugation of jasmonic acid with isoleucine to form the jasmonic acid-isoleucine complex (JA-Ile). It is important to study this interaction because this molecule plays a vital role in the signaling pathway that responds to stress experienced by the plant.



From left to right, Emma Morahan, Albert Le, Abhinav Krishnan, and Amanda Kendrick presented the research poster titled "The Comparison of Retinol and Retinal Binding to Squid Isorhodopsin."

Here's a snippet of their abstract:

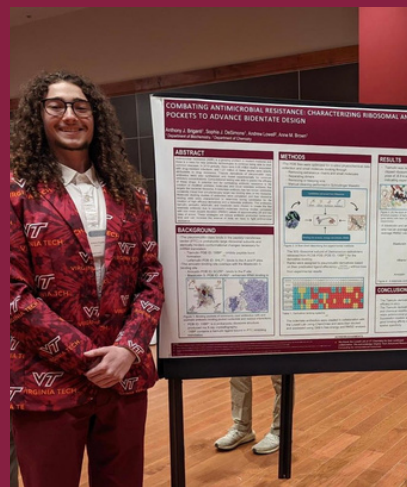
Rhodopsin is an important protein related to vision as it allows us to study the biochemical processes to gain a better understanding of eye function as a whole. We are using a squid as our model organism as squid are able to use their eyes in the depths of the ocean where little to no light exists. Understanding how rhodopsin in squids work in almost complete darkness and comparing this function to that of the human eye will provide us with insight on the significance of retinol and retinal binding to squid isorhodopsin.

UNDERGRADUATE STUDENT FEATURES

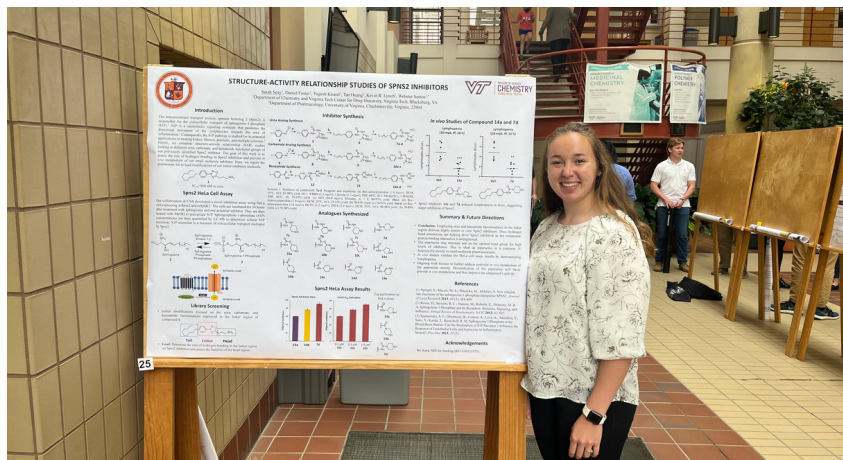
Dennis Dean Conference

The 2022 Dennis Dean Undergraduate Research and Creative Scholarship Conference included displays from 281 Virginia Tech college students representing eight of the college's schools and eight native high school college 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. Check out our students research projects and read about their experiences presenting below.

Anthony Briganti, accelerated master's student, presented on his poster titled "Combating Antibacterial Resistance: Characterizing Ribosomal Antibiotic Binding Pockets to Advance Bidentate Design." Briganti, along with his teammate, Sophia DeSimone (not pictured), were advised by Anne Brown, assistant professor of biochemistry.



Here's a snippet of the the pair's abstract: Antimicrobial resistance (AMR) is a growing problem in modern medicine and there is a need for new antibiotic technologies to continue being able to treat common diseases. In 2019 globally, there were 4.95 million deaths associated with drug-resistant infections, and 1.27 million of these deaths were directly attributable to drug resistance. Triazole derivatives of pleuromutilin class antibiotics were also synthesized and tested experimentally for minimum inhibitory concentrations. Computational testing was able to predict the efficacy of these drugs. A potential tool for combatting antibiotic resistance is the creation of modified antibiotic molecules and novel bidentate antibiotic that targets the bacterial ribosome.



Sarah Seay, senior, presented her research on the first-ever inhibitors of spinsters homolog 2 (Spns2) for the treatment of multiple sclerosis.

"The Dennis Dean Conference was by far the best poster session I have participated in," said Seay. "I appreciated how engaged the judges were in my presentation and that I was able to interact with the research that other students are doing across disciplines here at Tech!"

Kathryn Paasch, junior, presented her poster titled "Biochemical Characterization of a Flavin-Dependent Monooxygenase from *Zonocerus variegatus*."

"My favorite part about participating in the conference was that I could communicate scientifically with others," Paasch said. "In addition to practicing my public speaking skills, communicating with others who were not familiar with my research allowed me to explore different aspects of my knowledge independently."



UNDERGRADUATE STUDENT FEATURES

Summer Fellowships, Internships, and Research

GRACE FINCH



Grace Finch, sophomore, participated in the National Institute of Standards and Technology (NIST)'s Summer Undergraduate Research Fellowship (SURF) program virtually.

NIST is seeking to make a new float glass Standard Reference Material (SRM) that can be used on the microscale, particularly for the forensic community. During this fellowship, Finch's role was to utilize Neutron Activation Analysis (NAA) to retrieve data about the concentrations of Lanthanum, Thorium, Neodymium, Cerium, Rubidium, and Uranium in three float glass standards to see if they have the potential to become SRMs.

Because NAA doesn't require many in-person elements, a remote research fellowship with the NIST was a great opportunity for Finch.

"A big part of being a scientist is looking at the data an experiment yields and reasoning about it, maybe even a bigger part than being able to run an experiment someone else designed. I got hands-on experience breaking down data to see exactly what it was telling us and then drew conclusions about that data," Finch said.

"All these skills are necessary for being a scientist, just as much as measuring things in the lab, and I got the chance to practice them in a very real setting. I would definitely encourage my peers to consider a virtual internship! You will still learn a lot."



DYLAN REIL

Dylan Reil, senior, participated in the University of Miami's Summer Undergraduate Research Fellowship (SURF) program this past summer. The research internship was funded by the National Cancer Institute and he's working in the Biochemistry and Molecular Biology department in the University of Miami Miller School of Medicine.

During his time in the program, he lived on the University of Miami's main academic campus in Coral Gables. He completed research full-time and attended daily career workshops/events that were scheduled in the program. His project was to synthesize a new fusion protein that could potentially be used for deep tissue imaging and early screening of diseases like Crohn's disease and ulcerative colitis. He attempted to combine the functionality of two proteins, one of which binds to the surface of wounded/inflamed cells and one that is a bioluminescent enzyme. The goal was to make the fusion protein as small as possible to maximize efficiency while retaining the proper binding and catalytic functionalities.

UNDERGRADUATE STUDENT FEATURES

Summer Fellowships, Internships, and Research



ALLISON PENNINGTON

Allison Pennington, junior, worked as a Clinical Intern at the Children's Hospital of The King's Daughters (CHKD), a pediatric care facility in Norfolk, Virginia. She worked in the ambulatory resource pool and was stationed in the endocrinology outpatient clinic and diabetes education center.

"I thoroughly enjoyed the crossover between what I did during my internship and my biochemistry background," Pennington said. "Analyzing lab results and learning about the biological pathways of diabetes and the endocrine system felt like a great real-life application of what I've learned at Virginia Tech!"

SARAH SEAY

Sarah Seay (left), senior, served as a Snyder Scholar at the University of Illinois Urbana-Champaign, where she worked in Jefferson Chan's lab under Selena Hernandez (right), doctoral student.

The chem-bio lab focuses on molecular imaging and synthesis for aging, photo-acoustic probing, and targeted drug delivery. Seay's work was centered around the organic synthesis of photo-acoustic dyes designed for cancer probing. She used her background in organic synthesis and structure activity relationship (SAR) studies from Webster Santos' lab at Virginia Tech to aid her approach in her summer research.

ALLIE KOLLITZ

Allie Kollitz, senior, completed a summer internship in genetics research at Magee-Womens Research Institute & Foundation in Pittsburgh, Pennsylvania. She focused on disorders of sex development (DSD), which is a rare group of disorders that describes individuals whose reproductive organs, whether internally or externally, do not develop correctly. Specifically, Kollitz was trying to figure out what genes may have caused the disorder for each individual patient. This involved assessing and analyzing the many variants in the genome that a patient may have in order to find gene mutations that could be pathogenic (the cause of the disease).

UNDERGRADUATE STUDENT FEATURES

Virginia Tech's Ryan Fishback earns Elite 90 award



Everything felt normal when Virginia Tech tennis biochemistry sophomore Ryan Fishback was practicing with doubles partner Jordan Chryostom a day before the NCAA Division I championships began in Champaign, Illinois. Then the head men's tennis coach, Jim Thompson, stopped practice. A bit of confusion came across the faces of both Fishback and Chryostom as they were asked to make their way to the center of the practice court. Thompson had been working behind the scenes to coordinate a surprise for Fishback. Presented at each of the NCAA's 90 championships, the Elite 90 award is given to the student-athlete with the highest cumulative GPA participating at the finals site. With a 4.0 GPA in biochemistry, Fishback fit the bill for the honor.

As John Bugner, NCAA associate director of championships and alliances, began to explain the award to the group huddled at the center of the practice court, a smile filled Fishback's face. "The first reason I come to college is to get a good education, and my future goals are to go to medical school someday," Fishback said. "And obviously I feel very fortunate to be able to play tennis in college as well, but the first priority has always been academic."

The fourth Virginia Tech student-athlete to win an Elite 90 award, Fishback received the honor with his Virginia Tech coaches and teammates by his side, along with his first tennis coach – his father, Chip. His presence was a fitting addition to an already meaningful honor.

"He's been the only tennis coach I've ever had, except for here in college," Fishback said of his father. "From the time I was 3, that's the person I remember on the tennis court. He also instilled in me, along with my mom, prioritizing academics over tennis. It was great for that to come full circle."

Chip Fishback, who spent 21 years as a tennis coach at the Division III level, understands the difficulty of balancing a rigorous academic load with a collegiate sport. The former Hobart/William Smith coach's only word for his son's perfect GPA with such a challenging major is "remarkable."

"Ryan has been doing so well in the classroom and on the tennis court since he was young that this really isn't a surprise so much as validation for what he stands for. He's always been committed to excellence on and off the court. I'm just thrilled to death," Chip said as he beamed while holding back tears, shortly after texting Ryan's mother about the honor. "I was thrilled to find out Ryan had been given this NCAA Elite 90 award."

The primacy of education was instilled in Ryan from a young age, which is when he also discovered his passion for medicine. His inspiration for pursuing the medical field stems from his mother's work as an ICU nurse and a nurse in private care. That, coupled with his passion for math and science, made biochemistry the perfect pursuit for him. Ryan compares his sport with his field of study in terms of the time commitment and dedication both pursuits require. If he isn't at the tennis center, Ryan is usually studying or sleeping. He credits balancing his sport and his studies for his time management skills.

"I have to be very diligent when it comes to setting aside time for an upcoming exam.... It keeps me disciplined," Ryan said.

Thompson, who was willing to stop practice prior to the start of the national championship doubles competition, has supported Fishback in his rigorous studies every step of the way.

"My coaches have been great," Fishback said. "It's not always easy if I have to miss class or miss practice or lifting. They've been very eager to let me prioritize academics first and let me make up tennis whenever I have time."

GRADUATE STUDENT HIGHLIGHTS

Biochemistry Graduate Student Association (BcGSA) News

Meet the newest members of our BcGSA Executive Board! The Biochemistry Graduate Student Association (BcGSA) at Virginia Tech was founded in 2017 and is affiliated with the Fralin Life Sciences Institute and the Department of Biochemistry. We strive to promote communication between graduate students, postdocs, and faculty members, and to foster academic freedom and professional development of biochemistry graduate students through sponsoring recruitment or orientation activities for new students, awarding travel grants for biochemistry graduate students, directing the student journal club, maintaining the peer mentoring program, and creating a cohesive and fulfilling social experience for graduate students. This group was elected to serve for the 2022-2023 academic year.



HALEY MICHEL, PH.D. STUDENT
PRESIDENT



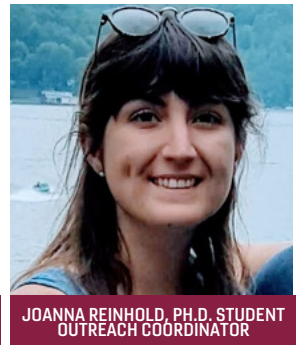
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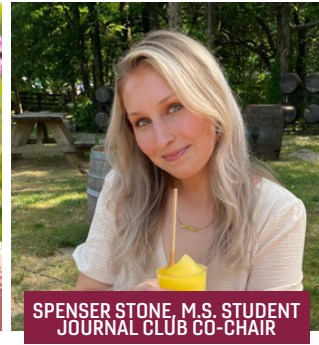
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OUTREACH COORDINATOR



LAURA GIL PINEDA, PH.D. STUDENT
DEI REPRESENTATIVE



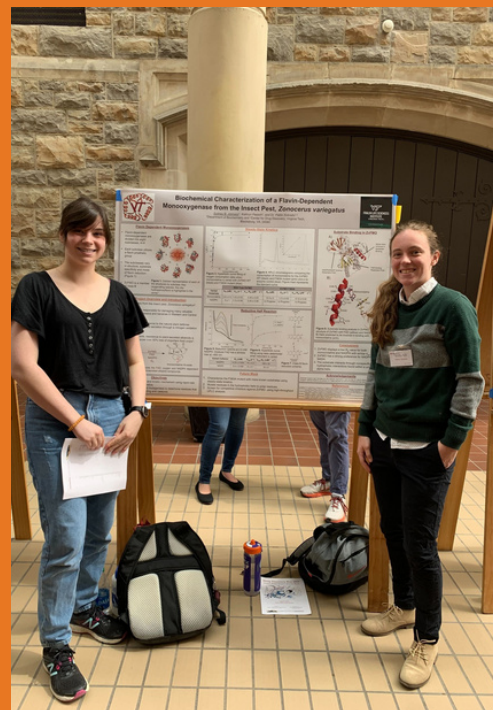
CHRISTEN HUGHES, PH.D. STUDENT
RECRUITMENT/ORIENTATION CHAIR



SPENSER STONE, M.S. STUDENT
JOURNAL CLUB CO-CHAIR



PAUL KAVANAUGH, M.S. STUDENT
JOURNAL CLUB CO-CHAIR



The recipients of the Spring 2022 BcGSA mentoring fellowship were Sydney Johnson, doctoral candidate and Kathryn Paasch, junior. Their proposal was titled "Identification and Characterization of Active Site Residues in a Unique Nitro-Forming Flavin-Dependent Monooxygenase: CreE." In Pablo Sobrado's lab, the pair mutated residues in the catalysis of a unique enzyme and have increased their mechanistic understanding.

"This project has allowed me to see Kathryn become an independent undergraduate researcher, and to express her knowledge to the fullest extent," said Johnson. "Watching Kathryn grow into a scientist has been amazing to watch from my perspective!"

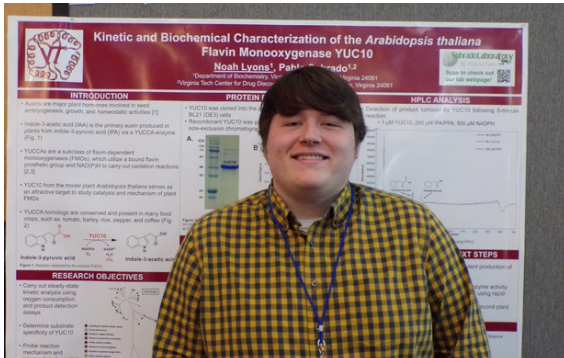
"I love working with Sydney! She first introduced me to different instrumentation in the lab (as I had never worked in a lab before due to COVID) and has remained supportive throughout my time in the lab," Paasch said. "This project has allowed me to explore my own skills in the lab with Sydney's support."

The BcGSA Mentoring Fellowship Award supports a deserving graduate student and promotes their development as a mentor. The goal is to empower the graduate student to develop a research project with an undergraduate researcher who is already doing research in the lab, and mentor this undergraduate student throughout the duration of their project. Fellowship guidelines and the application rubric can be found online on our website.

GRADUATE STUDENT HIGHLIGHTS

Biochemistry Graduate Student Association (BcGSA) News

The purpose of the BcGSA Travel Grant is to provide financial support for biochemistry graduate students to attend conferences or workshops where they will have the opportunity to present research, develop professional relationships, and gain knowledge from colleagues in their respective field. Grant guidelines and the application rubric can be found online on our website. Below are our Spring 2022 recipients.

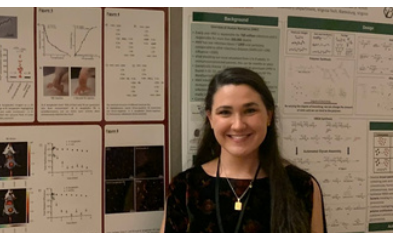


Thanks to the BcGSA Travel Grant, Noah Lyons, a doctoral candidate in Pablo Sobrado's lab, was able to attend the Southeast Enzyme Conference in Atlanta to present the work he's completed on his research project

"Receiving the BcGSA travel grant helped cover my conference costs, allowing me to focus and enjoy the knowledge being shared at the conference," Lyons said.



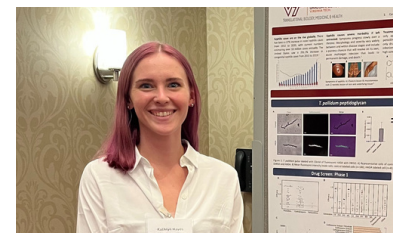
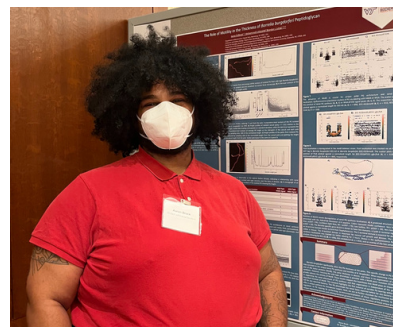
Jutras Lab members Mecailla McClune (far left), Addie Hayes (second from left), and Aaron Brock (second from right) were also Spring 2022 recipients of the BcGSA Travel Grant. The three researchers presented at the 2022 Gordon Research Conference. (Photographed on the far right is Mara Kushelman '21, '22 M.S., who successfully defended their thesis "The identification and characterization of a unique FemX homologue in *Borrelia burgdorferi*, and insights into the peptidoglycan biosynthesis pathway" this past summer.)



"Receiving the BcGSA travel grant helped fund my transportation to one of the premier conferences in my research field. This opportunity allowed me to discuss my findings and network with a wide variety of established scientists," said doctoral candidate, McClune. After the Gordon Research Conference, she'd go to present at the VT CeZAP Infectious Diseases Symposium where her poster, which displayed her recent Lyme Disease findings, received an Award of Excellence!



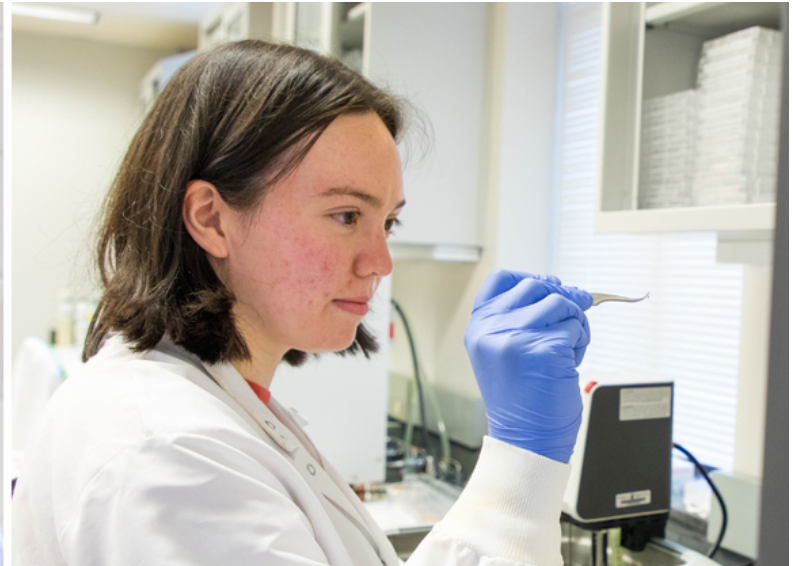
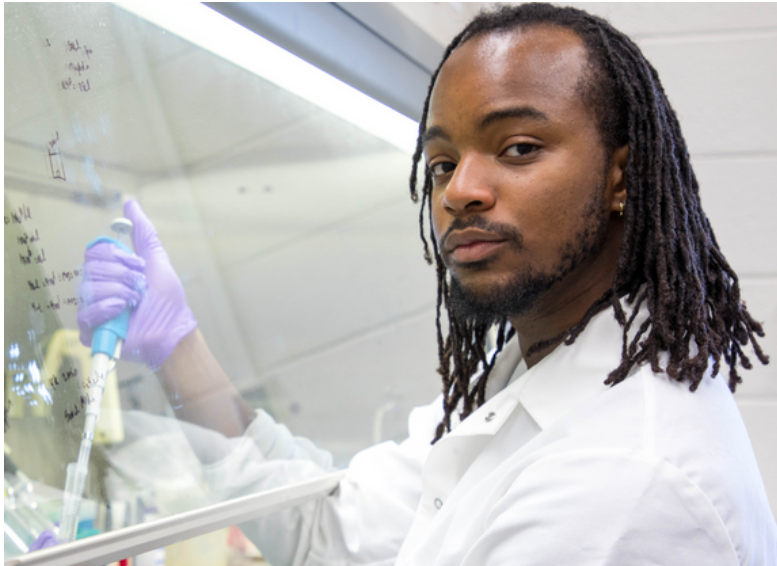
"With this funding, I could attend this conference, present my work to the field, and get essential feedback on my thesis. I was also able to expand my network to well-established scientists," said doctoral candidate, Brock. Over the summer, he also presented on the structure and biosynthesis of peptidoglycan in *Borrelia burgdorferi* and how motility may organize that biosynthesis at ASM Microbe 2022 in Washington, D.C. (left). This semester, Brock's presented his poster "The Role of Motility in the Thickness of *Borrelia burgdorferi* Peptidoglycan" at the VT CeZAP Infectious Diseases Symposium (right).



"The bacteria I work with is understudied even in this highly specialized field, and with this funding I was able to present my research to, get feedback from, and network with the pioneers of the *T. Pallidum* field," said Hayes, a graduate student in the Translational Biology, Medicine, and Health program. Since the Gordon Research Conference, she's presented a poster on her research about conducting a large scale drug screen to identify novel therapeutics for *Treponema pallidum*, the bacteria that causes syphilis, at the VT CeZAP Infectious Diseases Symposium.

GRADUATE STUDENT HIGHLIGHTS

Ut Prosim Fellowship supports two biochemistry students to pursue a master's degree



Thanks to an alumni donor and long-time supporter of the biochemistry program in the College of Agriculture and Life Sciences, two students were supported to pursue a masters degree in life sciences through the creation of a new fellowship called the Ut Prosim Fellowship. The Ut Prosim Fellowship was created with the goal of increasing diversity and inclusion at Virginia Tech and is inspired by the Virginia Tech motto “Ut Prosim” or “That I May Serve”, a motto that exemplifies not only the need to serve but a promise to serve. Those selected to receive the Ut Prosim Fellowship are students who have had a significant impact on their community, whether through outreach or mentorship, and demonstrate a strong work ethic and dedication to their research and academics.

The 2021-2022 inaugural recipient of the Ut Prosim Fellowship is Kevin Williams (left), advised by Daniel Slade, associate professor of biochemistry. Williams served as a biochemistry peer mentor for three years and got involved in undergraduate research during his second year. His first year in Zhao Feng Wang’s lab gave him a taste of what it meant to be a researcher and his experience in the Slade Lab throughout the rest of his undergraduate career and budding graduate career would mold him into the researcher he is today. Williams studied *Fusobacterium nucleatum*, a bacterium that lives in the human mouth that has been found to migrate throughout the body and cause a myriad of issues, including the potential to cause colon cancer to spread. His project was to research how this bacterium moves and survives travel through the body. Williams graduated from the department this past semester and he’ll attend the University of California, Berkeley to pursue a doctorate degree. His research interests include human immunology, inflammation, and infectious diseases, but he’s excited about the opportunity to rotate in a variety of labs in his program to discover what he’s really interested in.

“The fellowship provided me a framework to change my mindset and fully delve into what it meant to be a graduate level researcher, working full time, getting experiments done, all while having the support of the department,” said Williams.

The Department of Biochemistry is excited to continue to support students seeking a masters degree and has selected Helen Oker (right), accelerated master’s student, as the 2022-2023 recipient of the Ut Prosim Fellowship. Her advisor, Chloé Lahondère, assistant professor of biochemistry, nominated her for the award. Oker’s perspective of insects through a biochemical perspective landed her in the Lahondère lab, where she is now working on a project to take a closer look at the mosquito species *Aedes albopictus*, an important disease vector native to Southeast Asia that has made its way to Blacksburg, Virginia. Oker is responsible for observing key differences between the two strains of mosquitoes - one from Blacksburg, Virginia and one from Foshan, China. She’ll be taking note of each strain’s thermal performance levels, nutrient storage, and genetic makeup.

“There’s been so many things that have been made easier for me because my mentors, my advisor, and others in the department believed in me, especially during times when I didn’t believe in myself,” Oker said. “Once upon a time, a Ph.D. was something to aim for, but now, with the support I’ve received, getting a Ph.D. feels a lot more tangible.”

Read the full story in our Newsroom on our website.



Haley Michel, a doctoral student in Justin Lemkul’s lab, presented her research on the characterization of two G-quadruplexes found in the Long Terminal Repeat of HIV-1 using polarizable molecular dynamics simulations at G4thering, the eight annual international meeting on quadruplex nucleic acids in Marienbad, Czech Republic.

“It was an amazing opportunity to network with top researchers in the G-quadruplex community and share my research with them,” Michel said. “I also had the chance to explore an entirely new country and culture, which included me accidentally joining a water aerobics class that was, of course, all in Czech! What’s that saying? When in the Czech Republic!”

Ash VanWinkle, masters student, won best poster and presentation at the 2022 Phytochemical Society of North America meeting this summer. VanWinkle’s poster was titled “Determining the feeding success of herbivorous insects on *Arabidopsis thaliana* plants with altered inositol pyrophosphates.”



FACULTY AND STAFF SPOTLIGHTS

New Faculty & Staff

Join us in welcoming Lisa Jones (left), Dana Keith (center), and Wei Sun (right) to the department! Jones is our new Academic Program Coordinator and she joined our department in July. Keith joined our department as our new Human Resource Specialist in late May. Sun, assistant professor, joined the department in August after serving as a postdoctoral associate at the University of California, San Francisco. His research focus is in RNA Biology.



Kylie Allen, assistant professor of biochemistry, received seed funding from Virginia Tech's Institute for Critical Technology and Applied Science (ICTAS). This grant is funding her project with Valerie Wellborn, assistant professor of chemistry, on DNA-scaffolded synthetic enzymes for tunable high performance catalysis: an integrated computational and experimental approach.

Grants



Anne Brown, assistant professor in Virginia Tech Libraries and of biochemistry, received seed funding from the Virginia Tech Institute for Critical Technology and Applied Science (ICTAS). This grant will fund her project on Accelerating Late-Stage Drug Functionalization for RNA Viruses in collaboration with Sanket Deshmukh, assistant professor of chemical engineering; Andrew Lowell, assistant professor of chemistry; and James Weger, assistant professor of biomedical sciences and pathobiology.



LINK+LICENSE+LAUNCH's most recent Inventor Spotlight features Catherine Freed, postdoctoral associate, Catherine Freed. Freed focuses on the enhancement of food security by developing crops which mitigate phosphate fertilizer pollution and increasing the efficiency of phosphate use and uptake in agricultural applications.



Karthikeyan Chandrasegaran, postdoctoral associate, has been featured in various news articles to apply his expertise on evolutionary ecology and mosquito biology on a developing mosquito-density problem in India.

Media Mentions

In Memoriam



Robert "Bob" Reinhart Schmidt, 89, of Blacksburg, passed away on October 16, 2022 of natural causes. He is survived by his wife Phyllis of 66 years, his four children and spouses, 12 grandchildren, and two great grandchildren. Schmidt graduated Falls Church High school in 1951 and went on to receive his Bachelor of Science degree in Horticulture from Virginia Tech in 1955 while serving on the Battalion Command Staff in the Corps of Cadets. He received his Master's degree in Plant Physiology from the University of Maryland in 1957 and his Doctorate in Biochemistry from Virginia Tech in 1961. He joined the Biochemistry faculty at Virginia Tech after graduation and became the youngest full professor in Virginia Tech history. The full obituary is available to read on our website.

Department Head Search

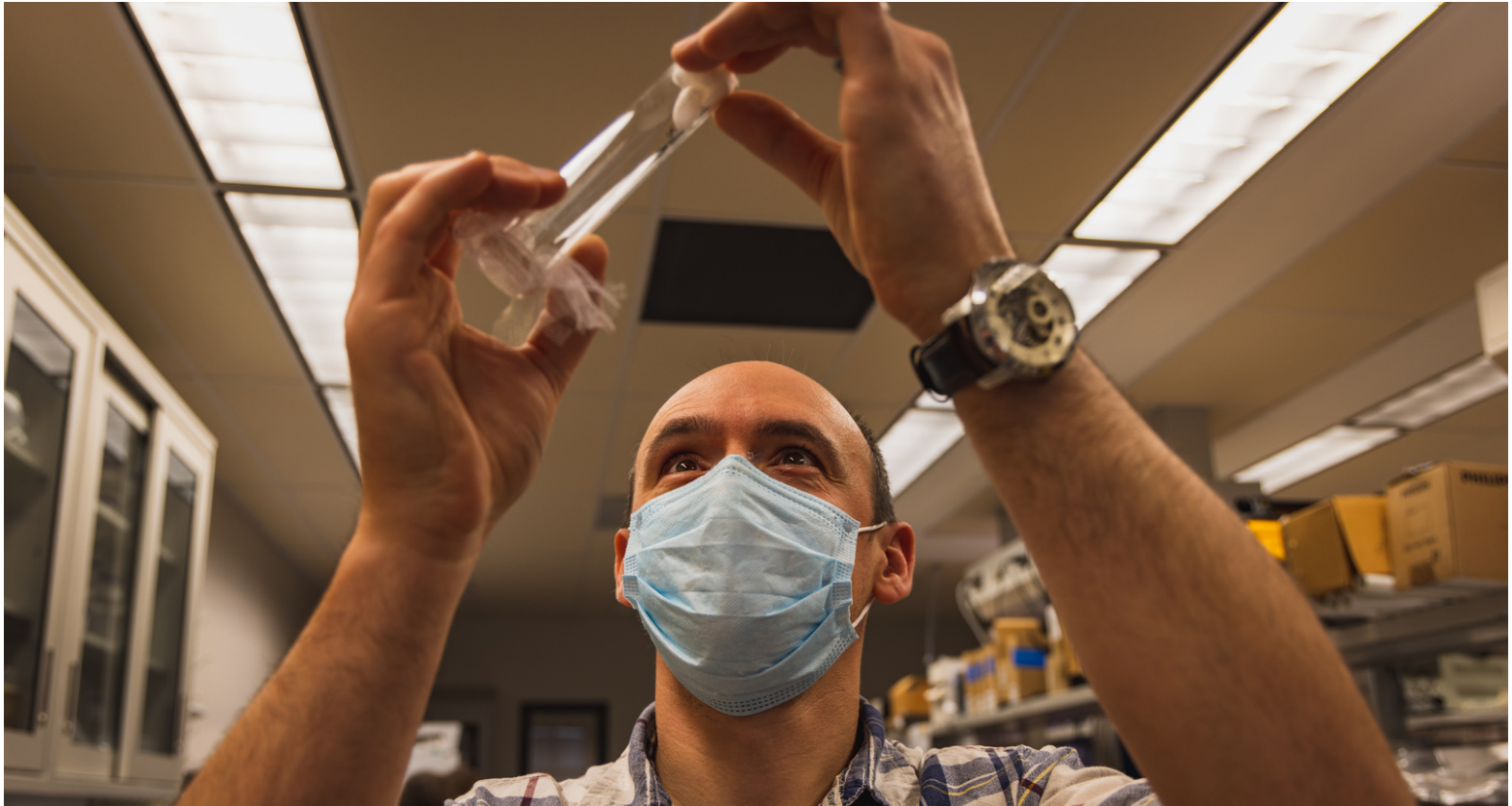
Virginia Tech seeks applications and nominations for the position of Professor and Head of the Department of Biochemistry (BCHM) in the College of Agriculture and Life Sciences, a tenured twelve-month academic and administrative appointment.

The Department boasts over \$4M in annual research expenditures, with active, extramurally-funded research programs in diverse areas of biochemistry including: protein structure/function, vector-borne diseases, signal transduction, and the molecular basis of human health and disease.

Visit our website to find more information about this position and to apply!

FACULTY AND STAFF SPOTLIGHTS

Could stopping 'zzz's' prevent mosquitoes from spreading disease?



Small in size but mighty with their bothersome bites, mosquitoes are often considered the deadliest animals on Earth. That's because the World Health Organization estimates 725,000 people die each year from mosquito-borne diseases. Many of these diseases, such as the West Nile virus and yellow fever, have experienced recent resurgences and caused public health crises. To combat these deadly menaces, a professor in Virginia Tech's College of Agriculture and Life Sciences is researching a state of relaxation that is integral to both insects and humans alike.

Clément Vinauger, an assistant professor in the Department of Biochemistry, received a two-year \$430,000 R21 grant from the National Institutes of Health to research the sleep habits of mosquitoes with the thought that if sleep-deprived humans have trouble functioning, maybe sleep-deprived mosquitoes do too. Vinauger is collaborating with a team from the University of Cincinnati in this research, the first of its kind to study how sleep deprivation may affect a mosquito's ability to find human hosts or even stop its ability to spread disease.

"People are suffering and dying all over the world from these diseases, and with climate change, it's getting worse," Vinauger said. "To me, that's the most obvious demonstration that we need to think outside of the box."

A good or bad night's sleep can define a person's day, and the same goes for mosquitoes. In humans, a good night's rest improves memory, immunity health, energy level, and many other functions that contribute to overall well-being. Unfortunately, solid sleep is just as helpful to the mission of mosquitoes. The more sleep they get, the more likely they are to buzz, bite, and spread disease. Fortunately, though, sleep-deprived mosquitoes are just as miserable as the sleep-deprived humans they hunt. Most disease-spreading mosquitoes are found in cities, where people, noise, and sound are most populous. But even amongst the hustle and bustle of city life, mosquitoes, like other insects, find time to sleep. More scientifically, they reach a sleep-like state when they land, rest their limbs, and stay immobile for long periods of time, Vinauger said. Vinauger's studies suggest that when these states of sleep are interrupted - mosquitoes are prevented from landing and resting - they show signs of fatigue, similar to humans.

"Let's say you stay out too late on Saturday night. You feel miserable on Sunday and require more sleep to rebound," Vinauger said. "Mosquitoes do the same thing when they don't sleep well. The next day, they are very bad at making decisions."

Important decisions like when and where to find a human host.

The research grant awarded by the National Institutes of Health to Vinauger and grant co-principal investigator Joshua Benoit of the University of Cincinnati will expand upon these studies with two objectives: to characterize what goes on inside mosquitoes' brains when they sleep and to define the consequences when they are deprived of it.

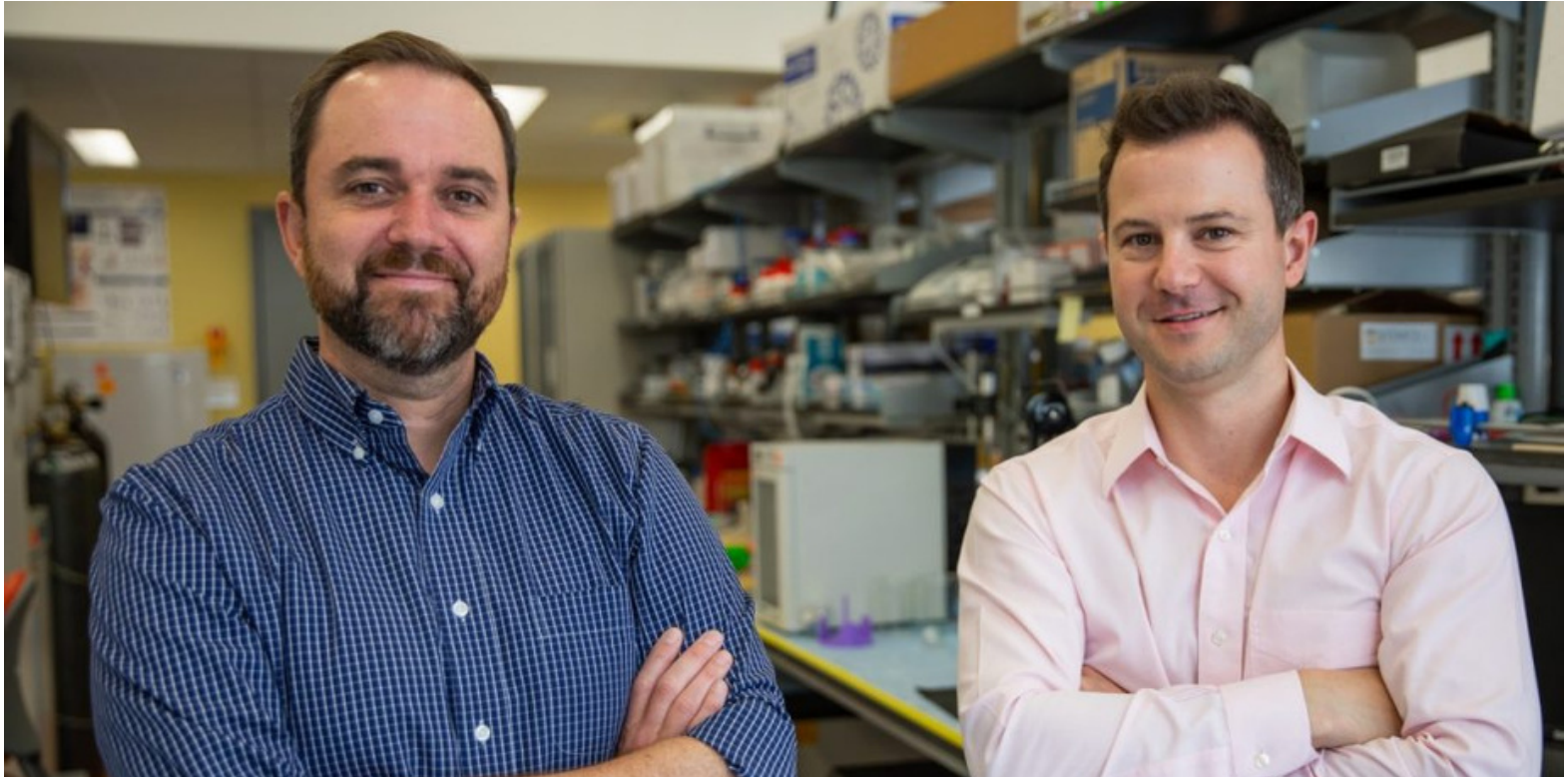
Vinauger has recruited Shajaesza Diggs, a master's student, and Nicole Wynne, a Ph.D. candidate, to assist him inside his laboratory in Steger Hall.

"We have a nice preparation in the lab here at Virginia Tech where we can record the electrical activity of neurons in the brains of mosquitoes while they sleep, so we can evaluate how sleep is impacting the way their brain functions," he said. "We are also going to sleep-deprive the mosquitoes and test their ability to transmit viruses and see how that impacts them."

Read the full story in our Newsroom on our website.

FACULTY AND STAFF SPOTLIGHTS

Virginia Tech researchers discover how bacteria make pancreatic cancer cells grow and move



Virginia Tech researchers from the Department of Biomedical Engineering and Mechanics and the Department of Biochemistry have discovered a characteristic of a common oral bacterium that relocates to pancreatic cancer tumors that may help guide future therapeutic interventions for treatment. The bacterium, *Fusobacterium nucleatum*, may play a key role in how aggressively cancer grows and moves throughout the body. Pancreatic cancer is the third-leading cause of cancer-related death in the United States. One particularly aggressive form of pancreatic cancer, pancreatic ductal adenocarcinoma, has a survival expectancy of fewer than six months. Several characteristics make the disease difficult to treat, including its ability to suppress the immune system and its complex location and structure, which complicate surgery and chemotherapy delivery.

Scott Verbridge, associate professor in biomedical engineering and mechanics, and Barath Udayasurayan Ph.D. '22, an alumnus from the Virginia Tech-Wake Forest University School of Biomedical Engineering and Sciences, have conducted research on a bacterium found in pancreatic cancer tumors, among other types. Most notably, they discovered ways in which the bacterium may directly impact cancer progression and resistance to chemotherapy treatments. These results are featured in the Oct. 18 issue of *Science Signaling*.

Daniel J. Slade, associate professor in biochemistry and leading expert in microbes in cancer and their biochemical interactions with the tumor's microenvironment, also collaborated with Verbridge and Udayasurayan.

Verbridge's Laboratory of Integrative Tumor Ecology has been collaborating with Slade's team for years on cancer research. Together, they have made discoveries on the role of a specific microbe, *F. nucleatum*, in driving cancer cell migration, particularly in colorectal cancer.

Because this microbe is a common oral bacterium, it has often been studied in relation to mouth diseases such as periodontitis and gingivitis. But little was known about how the microbe travels to and adapts to living within tumor microenvironments, thereby increasing the aggressiveness of cancerous growths. Other cancer research had verified the microbe's presence in pancreatic cancer, leading Verbridge and his team to wonder if this bacterium also might be activating tumor migration in the pancreas.

"The tumor microbiome can affect the progression of cancer, so our goal is to better understand the role of these bacteria in cancer," said Udayasurayan, who was named Virginia Tech Graduate School's 2022 College of Engineering Outstanding Doctoral Degree Student. "Only in early 2022 was the tumor microbiome patently recognized as a hallmark of cancer. Cancer biology and infection biology were usually considered disparate fields of study, but recent merging of the two fields is revealing fundamental insights into cancer progression. Our focus is at the forefront of this emerging paradigm, and we are on the cutting edge of research, looking at things no one has before."

When first analyzing the migration of infected pancreatic cancer cells, the researchers ran into an unexpected hurdle: They found that the number of migrated cells was difficult to quantify, as the total seemed to drastically outnumber the population of cells they expected to find in the system. Using *in vitro* tumor-on-a-chip models, Verbridge and his team confirmed that this microbe can bind and invade the pancreatic cancer cells, which then secrete molecules that stimulate accelerated growth of cancer cells. This finding explained why the team was seeing so many more cells in their experiments than they expected. It also enabled them to identify an increase in the migration of infected cells.

Read the full story in our Newsroom on our website.

ALUMNI NEWS + UPDATES

Virginia Tech biochemistry alumnus William 'Bil' Clemons elected to National Academy of Sciences



William "Bil" Clemons, an alumnus of Virginia Tech's biochemistry department, has been elected to the National Academy of Sciences, one of the highest professional honors that can be bestowed upon a scientist. Members of the National Academy of Sciences serve pro bono as advisors to the nation on science, engineering, and medicine. New members are selected based on their distinguished and continuing achievements in original research.

"I was shocked when I was notified that I'd been elected to the national academy. It is truly an honor and one that I was humbled to accept," Clemons said. "The accomplishment highlights the fortunate support I've had throughout my career going back to my days as a biochem undergrad at Virginia Tech."

Clemons uses the tools of biochemistry to explore the molecular building blocks of life. He and his team of structural biologists at the California Institute of Technology work on problems related to how membrane proteins are made and inserted into cell membranes and focus on the chemistry of enzymes that catalyze the transfer of sugars onto lipids. The work completed in the Clemons Lab is critical to the development of novel therapeutics. Clemons obtained his bachelor's degree in biochemistry from Virginia Tech in 1995 and was College of Agriculture and Life Sciences' Distinguished Alumni Award Recipient for 2017-18. He started his research career in the lab of Walter Niehaus, professor emeritus of biochemistry. In Niehaus's lab, Clemons worked with enzymes from *Cryptococcus*, an invasive fungus transmitted through the inhalation of spores that causes the infection cryptococcosis. He attributes the fundamental training he received in the biochemistry undergraduate program to his readiness for graduate school.

In 2000, Clemons received his Ph.D. in biochemistry from the University of Utah while working jointly with the Laboratory of Molecular Biology in Cambridge, England. His graduate work contributed to solving the atomic structure of the ribosome with his dissertation advisor, 2009 Nobel Prize winner in Chemistry Venki Ramakrishnan. An organism's vital functions are managed by large, complex protein molecules produced in cells' ribosomes. There, genetic information from messenger RNA is translated into chains of amino acids that then build proteins. Using a method known as X-ray crystallography, Ramakrishnan, Clemons, and other researchers were able to map the structure of ribosomes. Among other applications, this information has been useful for the production of antibiotics. Clemons then went on to the Department of Cell Biology at Harvard Medical School as a postdoctoral associate for four years. He's the recipient of the National Institute of Health Pioneer Award and the Burroughs Wellcome Career Award in Biomedical Sciences. Clemons is currently a professor of biochemistry in the Division of Chemistry and Chemical Engineering at the California Institute of Technology in Pasadena, California. He joined the Caltech faculty in 2005.



IN MEMORIAM

Message written by Peter Kennelly, biochemistry professor and interim department head.

"The Department of Biochemistry lost a friend when Patti Taranto Erickson, an alumnus and member of our external advisory committee, succumbed to breast cancer this past Christmas Eve. When I arrived at Virginia Tech in 1989, Patti was an undergraduate biochemistry major working in Tom Keenan's lab. In an era where students tended to maintain a certain distance between themselves and the faculty, Patti was a breath of fresh air: bright, enthusiastic, engaged. Twenty years later, at the annual meeting of the American Society for Biochemistry & Molecular Biology, I spotted a familiar smile coming my way. It was Patti, a little older, who was now a faculty member at Salisbury University in Maryland, leading a gaggle of students she had brought to present their work. Because of our shared interest in education, our paths continued to cross year after year at various conferences and workshops. When the department established an external advisory committee, Patti was a natural choice and an energetic contributor, making the long-trip to Blacksburg to share her wisdom and serve as a poster judge at EngelPalooza, our annual celebration of undergraduate research. Patti enlivened and enriched the lives of everyone she engaged with. She will be missed."

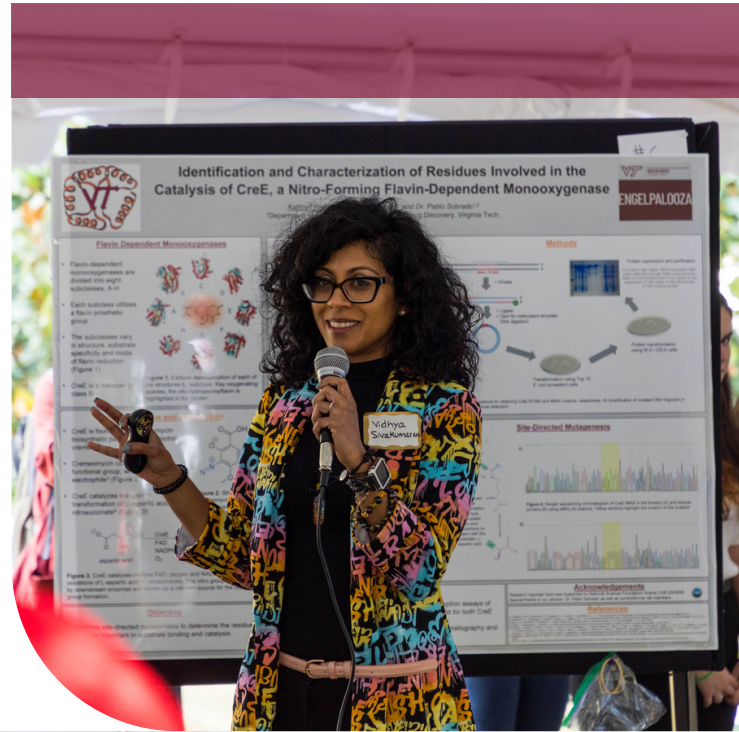


We want to thank biochemistry and microbiology alumnus, Dr. Ross Zirkle ('94, '96 M.S.), for visiting with our undergraduate and graduate students this semester in September. Zirkle met with our students to discuss career opportunities available at his organization DSM, a purpose-led science-based global company specializing in solutions for human and animal health and nutrition. It's always a pleasure to re-connect with our Hokie alumni!

ENGELPALOOZA

On Wednesday, October 12, 2022, the Department of Biochemistry hosted its fourth annual student research showcase: EngelPalooza! This year, the event was held outside on Fralin Lawn from 10:30AM-2:30 PM and we want to thank everyone who joined and made this such a great event! 170 people attended this year's EngelPalooza! We started off the morning with a keynote presentation from biochemistry alumna, Vidhya Sivakumaran ('10). Her presentation covered her time at Virginia Tech and how her career has evolved over the years in ways she didn't expect. Before concluding her presentation, Sivakumaran bestowed her wisdom onto our students.

Throughout the late morning and early evening, we had 23 undergraduate presenters and 14 graduate presenters share their expertise with fellow scientists in our department, people within the Virginia Tech scientific community, and beyond! Research topics throughout the showcase covered computational chemistry and molecular dynamics, pathogenesis and vector-borne disease, drug discovery, flavin redox chemistry, glycomaterial characterization, insect-plant interactions, and molecular plant physiology. We also had two live science demonstrations of Oxford Nanopore Sequencing and Virtual Reality Molecular Modeling and received a visit from the HokieBird!





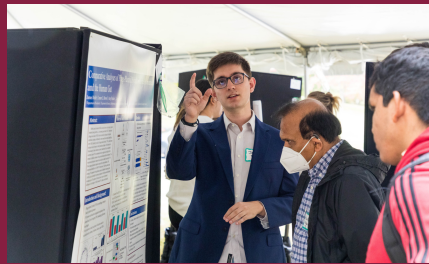
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ENGELPALOOZA

Additionally, there were six information tables present at EngelPalooza which covered various topics and opportunities in our department. Our students tabled for the Biochemistry Graduate Student Organization (BcGSA), our undergraduate biochemistry club, and the peer mentoring program. We also had faculty answering questions about ASBMB degree certification, how to get involved with undergraduate research, and study abroad opportunities. EngelPalooza is made possible by a grant from the Howard Hughes Medical Institute (HHMI) Inclusive Excellence program. Special thanks to the Biochemistry Department, as well as the department's Diversity, Equity and Inclusion Committee, for their continued support and involvement. Would you like to see more photos from this year's EngelPalooza? View them on our website or browse through our Facebook photo album!

Undergraduate Presenters Graduate Presenters

- Hannah Cannon
 - Maria Dorodnitsyna
 - Christa Greatorex-Potter
 - David Harris
 - Meghana Kamineni
 - Alysa Lanier
 - Riley Leathem
 - Mikaela LoBosco
 - Marion LoPresti
 - Emily Mechnick
 - Gabriel Mendelson
 - James Mullet
 - Kathryn Paasch
 - Madison Payne
 - Kiara Randhawa
 - Dylan Reil
 - Tantima Sattayaphanichkul
 - Shirin Sayani
 - Ryan Schurr
 - Sarah Seay
 - Overton Temple
 - Samantha Tollefson
 - Eric Truong
- Thuc-Anh Dinh
 - Bekah Fogarty
 - Maegan Gabby
 - Laura Gil Pineda
 - Christian Heryakusuma
 - Bela Khairunisa
 - Jiapeng Liu
 - Mecaila McClune
 - Haley Michel
 - Joanna Reinhold
 - Spenser Stone
 - Forde Upshur
 - Ash VanWinkle



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