

ENGEL HALL NEWS

LETTER FROM THE DEPARTMENT HEAD

May 11, 2022

Dear VT Biochemistry Alumni and Friends,

As we prepare for our graduation events this week, we're reminded of the importance of student engagement. The B.S. degree in Biochemistry is a rigorous and challenging program of study and we commend our graduates for their intelligence and diligence in mastering the chemistry of life. This spring, we will graduate 111 B.S. students, 9 M.S. students, and 5 Ph.D. students and we're so excited to see our graduates go on to do great things in the spirit of Ut Prosim. Many of our students are going on to employment at companies, such as Genentech and others, entering medical school or other health professions programs, and beginning graduate programs throughout the United States.

During the past year, we have made much progress in updating portions of our curriculum. In the Spring of 2022, we offered our first face-to-face version of a new hands-on laboratory course to second-year biochemistry students. This new course, Biochemical Techniques, allows students to enrich their quantitative understanding of biochemical concepts and to get more relevant hands-on lab experience earlier in their academic careers. While Dr. Richard Helm teaches the classroom portion of the course, Drs. Chloé Lahondère and Kristopher Hite, along with a Graduate Teaching Scholar, Brittany Hart, and a Graduate Teaching Assistant, Korliss Britt, teach the new accompanying lab portion. One novel element in the class is a project in which students use molecular techniques (DNA extraction, PCR, Sanger sequencing and data analysis) to determine the hosts that local mosquitoes feed on. This data can then be used to better understand pathogen transmission cycles in Virginia and will give our students a chance to contribute to an authentic research project that has an impact on our state.

Our continuing investment in new teaching laboratory equipment is greatly augmenting our ability to provide world class laboratory experiences for our students. We were recently highlighted in Virginia Tech news for investing in an open-source liquid handling robot and a qPCR machine to introduce automated systems to our students and to further train and prepare students for their careers in industry. Students were able to use both of these new instruments in our BCHM 4124 laboratory course.

Of course, our biggest news this year is that our department was recognized as a University Exemplary Department, in recognition of our ability to increase our students' sense of belonging, a top priority and goal of ours since 2018. To achieve a stronger sense of student belonging, we've launched our EngelPalooza student research showcase and hosted this event annually every fall semester; created our Peer Mentoring program, which gives first-year and transfer students the opportunity to receive support, direction, and guidance from fellow biochemistry majors further along in their academic career; and have held various activities centered on promoting a more inclusive environment to all in the department. We recognize the efforts of our terrific academic advisors, Amy Rasor and Jen Stewart, and welcome you to continue to help us in these efforts. Consider volunteering your time to meet our students, either via Zoom or in-person.

As always, if you are ever in Blacksburg, please stop by our main office in Engel Hall, as we welcome visitors and like to hear about what our alumni are doing.

Have a happy summer and go Hokies!

Sincerely,
Glenda E. Gillaspay
Professor and Head, Biochemistry
gillaspay@vt.edu | (540) 231-3062

Department of Biochemistry
340 West Campus Drive
111 Engel Hall
Blacksburg, Virginia 24061
Phone: (540) 231-6316
Fax: (540) 231-9070
biochem@vt.edu



COLLEGE OF AGRICULTURE AND LIFE SCIENCES
BIOCHEMISTRY
VIRGINIA TECH.

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
An equal opportunity, affirmative action institution

IN THIS ISSUE

DEPARTMENT NEWS

University Exemplary Department Award
Spring 2022 CALS Magazine Feature

UNDERGRADUATE STUDENT FEATURES

Class of 2022 Accomplishments
Recognizing our Undergraduate Researchers

GRADUATE STUDENT HIGHLIGHTS

2021 Award Winners + Class of 2022 Accomplishments
Catherine Freed receives Inspiring Innovator Award

ALUMNI NEWS + UPDATES

Promotions, Good News, + Seminar Presentations

FACULTY + STAFF SPOTLIGHTS

New Staff, Grants, Awards, Retirement, + Media Mentions
2021 Award Winners
GlycoMIP Grand Opening + Celebrating Dennis Dean
Elemental Carbon, Lyme Disease, + COVID-19

DONOR GRATITUDE

STAY CONNECTED

To follow the latest achievements of our students, faculty, staff and view recent departmental news, visit our website.

WWW.BIOCHEM.VT.EDU

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



DEPARTMENT NEWS



DEPARTMENT OF BIOCHEMISTRY NAMED UNIVERSITY EXEMPLARY DEPARTMENT HONOREE

The Department of Biochemistry has nearly 500 undergraduate majors earning degrees in two different colleges. Students are supported by over 130 department members, including 25 faculty, 15 research or professional faculty, 21 staff members, 41 graduate students, and many undergraduate researchers. The department has distinguished itself through initiatives to transforming student advising, innovating curriculum, refining experiential learning, and meeting student challenges and expectations during the COVID-19 pandemic. They have also developed and sustained academic community engagement activities for student well-being by building inclusive excellence and highlighting achievements and opportunities through enhanced departmental communications.

Presented annually since 1994, the University Exemplary Department or Program Award was developed as a part of Virginia Tech's Faculty Rewards Project, which sought to clarify the expectations of faculty and define appropriate rewards for their accomplishments. The annual awards program is presented by the Office of the Executive Vice President and Provost through the Center for Excellence in Teaching and Learning.

Nominations were submitted based on this year's theme of "developing and sustaining academic community engagement activities for student well-being and a sense of belonging." To be eligible for the University Exemplary Department or Program Award, the nominated department or program must have teaching and learning as a primary purpose and identify as a "department" (i.e., academic department or school) or "program" (i.e., an academic program).

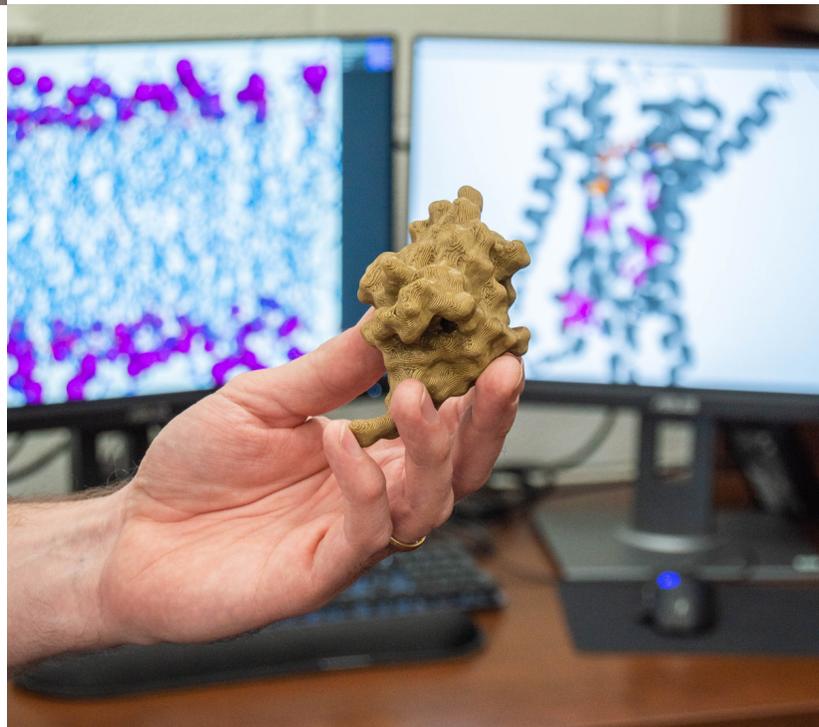
Read the full story in our Newsroom on our website.

BIOCHEMISTRY MAKES BIG IMPACT BY EXPLORING THE SMALLEST OF THINGS

The Department of Biochemistry was featured in the Spring 2022 edition of VT CALS Magazine. The 2-page spread highlights our top four research areas and how we've made an impact in each field and includes a timeline that spotlights important events that have led to the department's creation and to its continued growth.

Through its 70-year history, the Department of Biochemistry has dedicated itself to operating at the inflection point of chemical and physical sciences with physiological, genetic, and biological sciences. The result? A better understanding of biological events at the molecular level.

Read the full article and the rest of VT CALS Magazine here.



UNDERGRADUATE STUDENT FEATURES

Class of 2022 Accomplishments



MOLLY SIMEK

Molly Simek has been named one of the College of Agriculture of Life Sciences' Outstanding Seniors. Simek is also the recipient of the 2022 Phi Kappa Phi Medallion Award; only one such award is given to each college at Virginia Tech! Founded in 1897, the Honor Society of Phi Kappa Phi is the nation's oldest and most selective collegiate honor society for all academic disciplines. She's served the department as an undergraduate teaching assistant and the college as a CALS Ambassador.

HELEN OKER

Hellen Oker is a College of Science Outstanding Research nominee and recent recipient of the Ut Prosim Fellowship, which is awarded to a rising senior who has had a significant impact on their community and demonstrates a strong work ethic and dedication to their research and academics. This fellowship will support Oker to pursue a Master's degree.

IAN HICKLIN

Ian Hicklin was honored as one of the College of Science's Outstanding Seniors. Hicklin is also the recipient of the Thomas O. Sitz award. He has made a positive impact on the biochemistry community by serving as a peer mentor and as an undergraduate teaching assistant.

'21-'22 DEPT. SCHOLARSHIP WINNERS

- Laila Atta - R.W. and Frances H. Engel Scholarship
- Annamarie Budde - R.W. and Frances H. Engel Scholarship
- Brenna Hegedus - R.W. and Frances H. Engel Scholarship
- Christine Herzog - Kendall W. King Memorial Scholarship
- Rose Nelson - R.W. and Frances H. Engel Scholarship
- Albert Osei-Agyeman, Jr. - R.W. and Frances H. Engel Scholarship
- Kyle Rega - William Burns Downey Memorial Scholarship
- Melanie Revollo - R.W. and Frances H. Engel Scholarship
- Sarah Seay - R.W. and Frances H. Engel Scholarship
- Molly Simek - William Burns Downey Memorial Scholarship
- Senah Stephens - Kendall W. King Memorial Scholarship
- Rebecca Trimble - R.W. and Frances H. Engel Scholarship
- Taylan Tunckanat - Kendall W. King Memorial Scholarship

DEPARTMENTAL AWARD WINNERS

- Ethan Desverreaux - David R. Bevan Award
- Maegan Gabby - William E. Newton Award
- Ian Hicklin - Thomas O. Sitz Award
- Carter Wood - James Lewis Howe Award

GRADUATING CALS AMBASSADORS

- Sophie DeSimone
- Ethan Desverreaux
- Truitt Elliott
- Molly Simek

GRADUATING PEER MENTORS

- | | |
|--------------------|------------------|
| <u>Spring 2022</u> | <u>Fall 2021</u> |
| Annamarie Budde | Maegan Gabby |
| Juhi Chandrabhatla | Muskan Gupta |
| Taqiyah Chernesky | Bryce Wozniak |
| Brenna Hegedus | |
| Ian Hicklin | |
| Aayush Kharel | |
| Lena Moore | |
| Sophie Pickering | |
| Zoie Sadler | |
| Kylee Unnoppet | |
| Carter Wood | |

UNDERGRADUATE TEACHING ASSISTANTS

- | | |
|--------------------|-------------------|
| <u>Spring 2022</u> | <u>Fall 2021</u> |
| Ian Hicklin | Zachary Feldt |
| Maxim Johnson | Ian Hicklin |
| Carter Litton | Brittany Lawrence |
| Bayan Mohamed | Carter Litton |
| Sidney Munk | Garen Snow |
| Molly Simek | |
| Carter Wood | |

UNDERGRADUATE EXEMPLARY RESEARCH

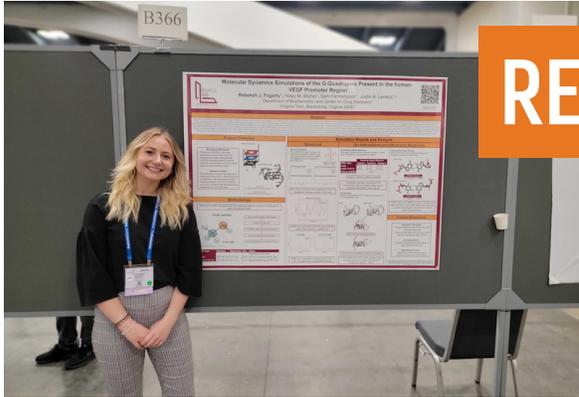
- Sophie DeSimone
- Ethan Desverreaux
- Truitt Elliot
- Rebekah Fogarty
- Ian Hicklin
- Maxim Johnson
- Benjamin Lewis
- Helen Oker
- Andrew Pedraza
- Shannon Pollock
- Zoie Sadler
- Kylee Unnoppet
- Caitlin Winner



Caitlin Winner

UNDERGRADUATE STUDENT FEATURES

April 18-22, 2022 marked the nationwide celebration of Undergraduate Research Week. To celebrate, we highlighted a few of our undergraduate researchers across all of our social media platforms. The research performed by these students represents the wide array of projects going on in our department.



REBEKAH FOGARTY

In Justin Lemkul's lab, Rebekah Fogarty performs polarizable molecular dynamics simulations on promoter G-quadruplexes, most notably the VEGF promoter GQ, a potential chemotherapeutic target. Her job? Uncover the dynamics of this structure and its ability to recruit ions.

MADISON PAYNE

Second-year biochemistry student, Madison Payne, analyzes differences in root phenotypes in *Arabidopsis thaliana* plants that have modified levels of inositol pyrophosphates and studies how sucrose impacts root growth and development in *Arabidopsis* seedlings in Glenda Gillaspay's lab.



RILEY LEATHEM

Riley Leathem is a biochemistry and clinical neuroscience double major and does research in the Virginia Tech Mass Spectrometry Research Incubator (VTMSI) for Richard Helm.

"Working in the VTMSI has given me an enjoyable and practical experience using the concepts I've learned in class. Obtaining spectra on compounds and being able to visualize the data has deepened my understanding of LCMS, while providing me with a unique research experience operating a mass spectrometer," Leathem said. "With the hands-on experience and analytical skills I've developed, I have gotten an opportunity to continue working with mass spectrometry at ORIC pharmaceuticals in San Francisco this summer. Thank you to Dr. Helm and Dr. Hildreth!"



MARIA DORODNITSYNA

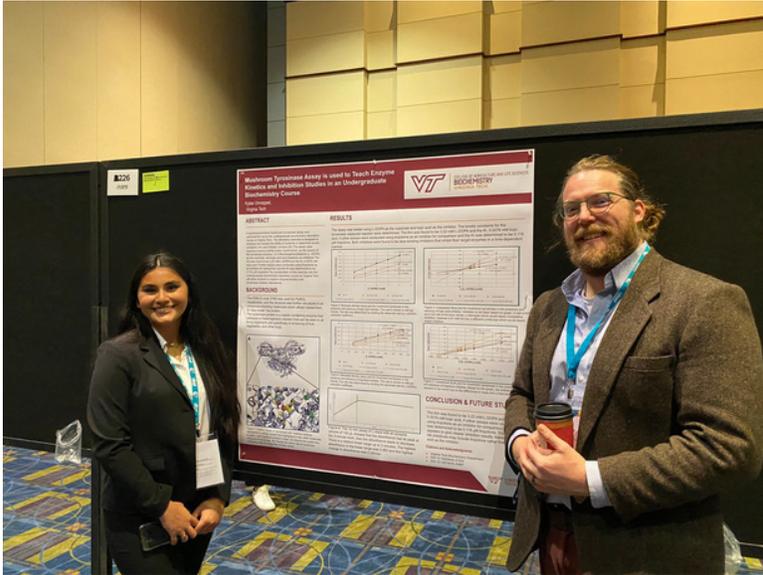
Maria Dorodnitsyna's project in Jinsong Zhu's lab is to identify a key component in the juvenile hormone signaling pathway in mosquitoes. This signaling pathway, which governs mosquito development and reproduction, can be exploited for the control of mosquito-borne diseases.

JAREN REX

Third-year biochemistry student, Jaren Rex, is working on expressing and characterizing recombinant malarial proteins in bacteria in order to better understand key metabolic pathways in Michael Klemba's lab.



UNDERGRADUATE STUDENT FEATURES



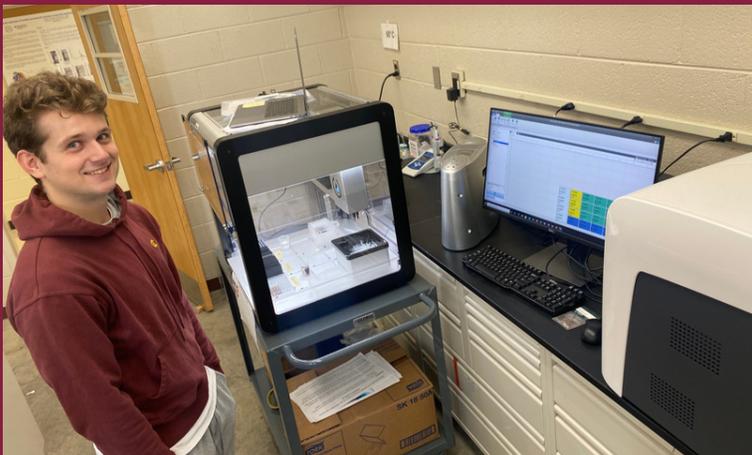
Biochemistry senior, Kylee Unnoppet, presented at the Experimental Biology meeting at the Pennsylvania Convention Center in Philadelphia. Unnoppet and her advisor, Kristopher Hite, attended as members of the American Society for Biochemistry and Molecular Biology (ASBMB), one of many professional organizations taking part in the meeting.

Unnoppet presented on an enzyme assay that she developed and optimized and that was used as the lab practical exam in our Lab Problems in Biochemistry course. Hite and Unnoppet are now adapting the enzyme assay to use as a kinetics learning module in the Biochemical Techniques lab.

Chrissie Herzog, recently received a grant from Stadium Woods-VT's Old Growth Forest and the Community Foundation of the New River Valley to identify mushrooms in Stadium Woods.

Herzog is a VT Massey Herbarium student and is inventorying mushrooms in Stadium Woods for her undergraduate research project. She'll use the funds for DNA sequencing to identify some of the more cryptic specimens she collects.

Stadium Woods is Virginia Tech's old-growth forest that is located next to Lane Stadium and has 300+ year old white oaks! Visit the woods now to see spring wildflowers coming into bloom. You can also visit Herzog's iNaturalist.org project documenting her findings.



Big day for BCHM 4124! Colin Short demonstrated the pipetting robot to fill 96-well plates and read absorbance measurements in the Thermo-Fisher Varioskan Lux plate reader. This is a MAJOR integration of two pieces of new, state-of-the-art equipment purchased by the department to enhance student experiential learning.

GRADUATE STUDENT HIGHLIGHTS

At the Department of Biochemistry's annual holiday party, four graduate students were recognized for their extraordinary contributions and dedication to research, teaching, and the department.



Mara Kushelman, second-year graduate student, received the Department of Biochemistry Teaching Award for outstanding teaching. Kushelman serves as the graduate teaching assistant for Concepts of Biochemistry, a large, lecture-based undergraduate course and dedicates several hours towards fostering student success. She takes notes and shares her annotated files with the entire class, holds hourly office hours twice a week, hosts two-hour long review sessions prior to all exams, offers assignment editing services, and acts as a mentor for students. Her nominators praised her for going above and beyond and either meeting or exceeding student expectations.



Darcy Davidson, fifth-year graduate student, was awarded the Department of Biochemistry Research Award for outstanding research. Her nominators praised her ability to consistently meet and exceed all of her research goals with multiple papers in progress. Nominators also selected Davidson because she advocates the importance and relevance of computational work for application in biochemical and biophysical disciplines. Davidson's research seeks to understand the biophysics of intrinsically disordered proteins to further develop treatment of neurodegenerative diseases, like Alzheimer's.



The Bruce M. Anderson Award was established in 1982 to honor the service of Bruce Anderson, department head of biochemistry from 1970-1982 and admired professor who passed in 2017. Noah Lyons, second-year graduate student, was selected as the recipient of this award, which is given to a second-year student who provided exemplary service and performed community building efforts in their first year. His nominators noted that he was an excellent teaching assistant in the undergraduate biochemistry lab. Additionally, they shared that Lyons was a great departmental citizen and was always the first person to volunteer for any number of departmental projects and tasks.



The Kendall W. King Memorial Scholarship is awarded to the most outstanding advanced graduate student who has passed preliminary examination and has made substantial progress on their dissertation research. The scholarship was created in 1980 in recognition of Kendall King, alumnus class of 1949, professor, and department head in 1966-1968. Catherine Freed, fifth-year graduate student, was the recipient of this scholarship, which recognizes potential for scholarly achievement in teaching and research and dedication to humanitarian service. Her dissertation research focuses on altering a specific group of molecules called inositol pyrophosphates (PP-InsPs) to develop plants that can be used to reclaim excess nutrients from polluted environments (specifically, Phosphorus).

GRADUATE STUDENT HIGHLIGHTS

Biochemistry postdoctoral associate, Catherine Freed, receives Inspiring Innovator award



The two recipients of the Inspiring Innovator Award, Catherine Freed (left) and Daphne Yao (right), photographed at the Celebration Innovation event at the Moss Arts Center. Photo by Christina Franusich for Virginia Tech.

The Inspiring Innovators award celebrates individuals who disclosed technologies to explore commercial applications. Through their enthusiasm, optimism, and vision of the future, they are inspiring the next generation of inventors.

Catherine Freed, a biochemistry postdoctoral associate, has made significant contributions in the plant science field by enhancing phosphate uptake and developing phytoremediation strategies using plants. Freed's inventions involve both mitigating phosphate fertilizer pollution by increasing plant phosphate accumulation in agricultural and aquatic environments as well as decreasing dependence on mineable phosphate reserves through converting enriched plant material into a sustainable, carbon-negative fertilizer. She is an inventor on four patent applications and has recently been awarded a proof-of-concept grant to explore commercial applications.

Virginia Tech students and faculty are propelling technologies from the lab into the world through commercialization and new ventures. Researchers who have advanced the innovation ecosystem by disclosing technologies, been named on issued patents, and achieved special milestones over the past year were honored at the inaugural Celebrating Innovation event, held recently at the Moss Arts Center.

The Virginia Tech inventions highlighted span a wide array of technology areas, including those related to vaccine development, cyber solutions, communications and advanced manufacturing technologies, and antimicrobial films that suppress the transmission of deadly diseases.

Hosted by Research and Innovation and LINK+LICENSE+LAUNCH, Brandy Salmon, associate vice president for Innovation and Partnerships, kicked off the event. In her remarks, she celebrated the work of researchers who make the extra effort to ensure their work is given a chance to be translated to markets, where it can have economic and human impact. She charged attendees to celebrate each other and engage with her team.

"Bring us challenges, and we [LINK+LICENSE+LAUNCH] will help navigate the complex process of commercialization – from technology disclosure to intellectual property management to marketing to licensing and start-up creation," said Salmon.

Despite complications for research due to the pandemic last year, the Virginia Tech research community disclosed over 140 new inventions, executed almost 30 new license agreements with commercial partners, and created seven new faculty-led start-up companies. Two new training programs, LICENSE Tech Transfer Bootcamp and LAUNCH Start-up Labs, are offered for faculty and students interested in learning more about technology transfer and start-up creation.

President Tim Sands, who is a fellow of the National Academy of Inventors, said, "An avenue of service that is becoming more central to the charter of land-grant universities is that of economic development. Technology licensing is one of the primary ways that we can turn the amazing work occurring at Virginia Tech into products and jobs that improve the lives of those around us."

Read the full story in our Newsroom on our website.

GRADUATE STUDENT HIGHLIGHTS

Class of 2022 Accomplishments



KALEB BOSWINKLE

Kaleb Boswinkle successfully defended his thesis "Investigating the Distribution and Biosynthesis of Modified F430 Co-Factors in Methanogenic & Methanotrophic archaea" and received his M.S. His advisor was Kylie Allen.



ERIN COLLINS

Erin Collins successfully defended her thesis "Defining Novel Clusters of PPAR gamma Partial Agonists for Virtual Screening" and received her M.S. Her advisor was Anne Brown.



CAITLIN CRIDLAND

Caitlin Cridland successfully defended her thesis "Inositol Pyrophosphate Phosphatases as Key Enzymes to Understand and Manipulate Phosphate Sensing in Plants" and received her Ph.D. Her advisor was Glenda Gillaspay.



DARCY DAVIDSON

Darcy Davidson successfully defended her thesis "Investigating the Electrostatic Properties and Dynamics of Amyloidogenic Proteins with Polarizable Molecular Dynamics Simulations" and received her Ph.D. Her advisor was Justin Lemkul.



CATHERINE FREED

Catherine Freed successfully defended her thesis "Elucidating the function of inositol pyrophosphate signaling pathways in Arabidopsis thaliana" and received her Ph.D. Her advisor was Glenda Gillaspay.



DIDIER MENA AGUILAR

Didier Mena Aguilar successfully defended his thesis "Proteomic and genomic characterization of the influence of copper on Legionella pneumophila and the drinking water microbiome" and received his Ph.D. His advisor was Richard Helm.



TAM NGUYEN

Tam Nguyen successfully defended her thesis "Decoding novel virulence strategies in Fusobacterium invasion and survival" and received her Ph.D. Her advisor was Daniel Slade.



ROWAN WOOLDRIDGE

Rowan Wooldridge successfully defended his thesis "CT610: A Mn-Dependent Self-Sacrificing Oxygenase in p-Aminobenzoate Biosynthesis in Chlamydia trachomatis" and received his M.S. His advisor was Kylie Allen.

Join us in congratulating these students for graduating and receiving their Master's degree this year!



Korliss Britt
Advisor:
Pablo Sobrado



Nick Francis
Advisor:
Pablo Sobrado



Parker Hiday
Advisor:
Daniel Slade



Johanna Parsnick
Advisor:
Pablo Sobrado



Taylan Tunckanat
Advisor:
Kylie Allen



Kevin Williams
Advisor:
Daniel Slade

ALUMNI NEWS + UPDATES

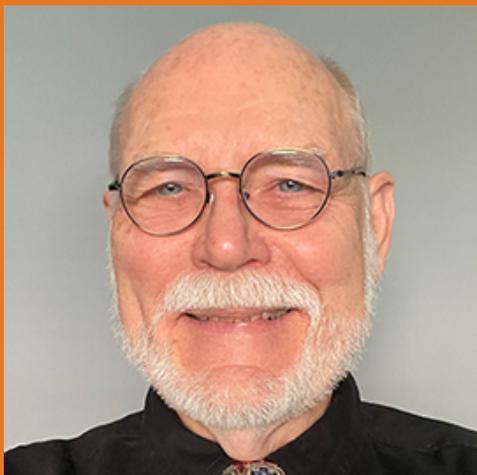


CATHERINE MURPHY

During the Fall 2021 semester, Catherine Murphy (B.S. '20) presented a seminar on Advocacy for Science, Discovery, and Innovation and talked about her role as an intern at the ResearchAmerica! alliance. Research!America advocates for increased funding for the National Institute of Health (NIH), Centers for Disease Control and Prevention (CDC), Agency for Healthcare Research and Quality (AHRQ), Food and Drug Administration (FDA), and National Science Foundation (NSF) at levels that keep pace with scientific opportunity. They also advocate for federal funding for global health research and a legislative and regulatory climate that stimulates growth in private sector research and development. Thank you for taking the time to talk about ResearchAmerica! and your experiences with our students and we wish you luck in your new role as a U.S. House of Representatives Intern!

ALLY THOMPSON

Ally Thompson (B.S. '20) gave a presentation to our BCHM 4124 class on how front-end computation design and automated systems are enhancing vaccine and drug-development research. Thompson used to conduct research in Biswarup Mukhopadhyay's lab and has recently been promoted to Associate Scientist at Thermo Fisher Scientific. Thank you for presenting on a timely and important topic in the scientific field to our class and congratulations on your recent promotion. We wish you the best of luck in your new role!



ALFRED MERRILL

In February 2022, the American Society for Biochemistry and Molecular Biology (ASBMB) announced that 28 members have been named fellows of the scientific society and two of these fellows are biochemistry alumni, Alfred Merrill (B.S. '74) and William "Bil" Clemons (B.S. '95). Merrill and Clemons were honored as ASBMB Fellows because of their dedication to the society, accomplishments in research, education, mentorship, advocacy, and diversity and inclusion, and service to the scientific community. Congratulations!



WILLIAM "BIL" CLEMONS

FACULTY AND STAFF SPOTLIGHTS

New Staff

We've had a number of people join our department in various roles over this semester. Join us in welcoming these individuals into the department!



Ricardo Acevedo-Siaca
Laboratory Technician
Phillips Lab



Kristen Cox
Fiscal Specialist



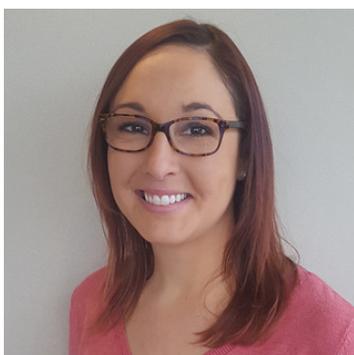
Caitlin Cridland
Postdoctoral Associate
Gillaspy Lab



Catherine Freed
Postdoctoral Associate
Gillaspy Lab



Mohamed Habib
Postdoctoral Associate
Sobrado Lab



Kylie Allen, assistant professor of biochemistry, received a U.S. Department of Energy Physical Biosciences grant and a National Science Foundation (NSF) Chemistry of Life Processes grant. These grants will help Allen to understand the functions and biosynthesis of modified F430 cofactors and to conduct a mechanistic investigation of radical SAM methylases involved in H4MPT biosynthesis.



Catherine Freed, biochemistry postdoctoral associate, recently received a two-year \$225,000 postdoctoral fellowship from USDA'S NIFA for translating knowledge on plant signaling molecules to circularize the Phosphorus economy and address Phosphorus crisis.



Patricia "Trish" Linkous, biochemistry's fiscal technician, was awarded the Most Impact in the Department award. Linkous has served the department for almost 15 years. She single-handedly oversaw all financial actions and kept critical operations going at a critical time in the department. Her nominators wrote that she was the key link in ensuring labs were able to perform the work they do by securing lab supplies and reagents. They also added that her knowledge of the financial systems within the department and at Virginia Tech is top notch and allows the department to host many fun events and continue to conduct research.



At our holiday party in December 2021, the department unveiled a new award, the Ever-Present Award, which recognized Sheila Early, biochemistry's graduate coordinator. Early's daily presence in the main office, along with her willingness to fill in for others and take on new duties, has allowed the department to provide excellent services for faculty, staff, students, and the public.

Grants

Awards

Retirement



Our Office Manager, Karen Dove, is retiring! Join us in extending our heartfelt thanks, congratulations, and best wishes on her very well-deserved retirement from Virginia Tech, after serving the department for over 40 years.

Media Mentions



Michael Klemba, associate professor of biochemistry, denies the claim that a recipe of grapefruit and lemon rinds will produce Hydroxychloroquine and clears up confusion about chloroquine and quinine in a January 2022 USA Today article.

FACULTY AND STAFF SPOTLIGHTS



Each year, the Department of Biochemistry celebrates and recognizes the accomplishments of its faculty in the core area of teaching and research. Two outstanding teaching awards were given to Daniel Slade, associate professor, and Justin Lemkul, assistant professor.

Lemkul's nominators raved about his successful creation of a new biophysics course, noting that he built the course from scratch. This new course will further promote interdisciplinary research projects in the biochemistry and biophysics disciplines.

Slade was put up for this award because of his ability to teach a challenging course during the pandemic and the impact he's made on students. In a recent video by the College of Agriculture and Life Sciences, featured biochemistry students said that they were thankful for Slade because he brought "energy into the classroom" and was able "to convey complex material in a way that's enjoyable" and "grab your attention, no matter how you were feeling that day."

Faculty recipients of the outstanding research awards were Brandon Jutras, assistant professor, and Kylie Allen, assistant professor.

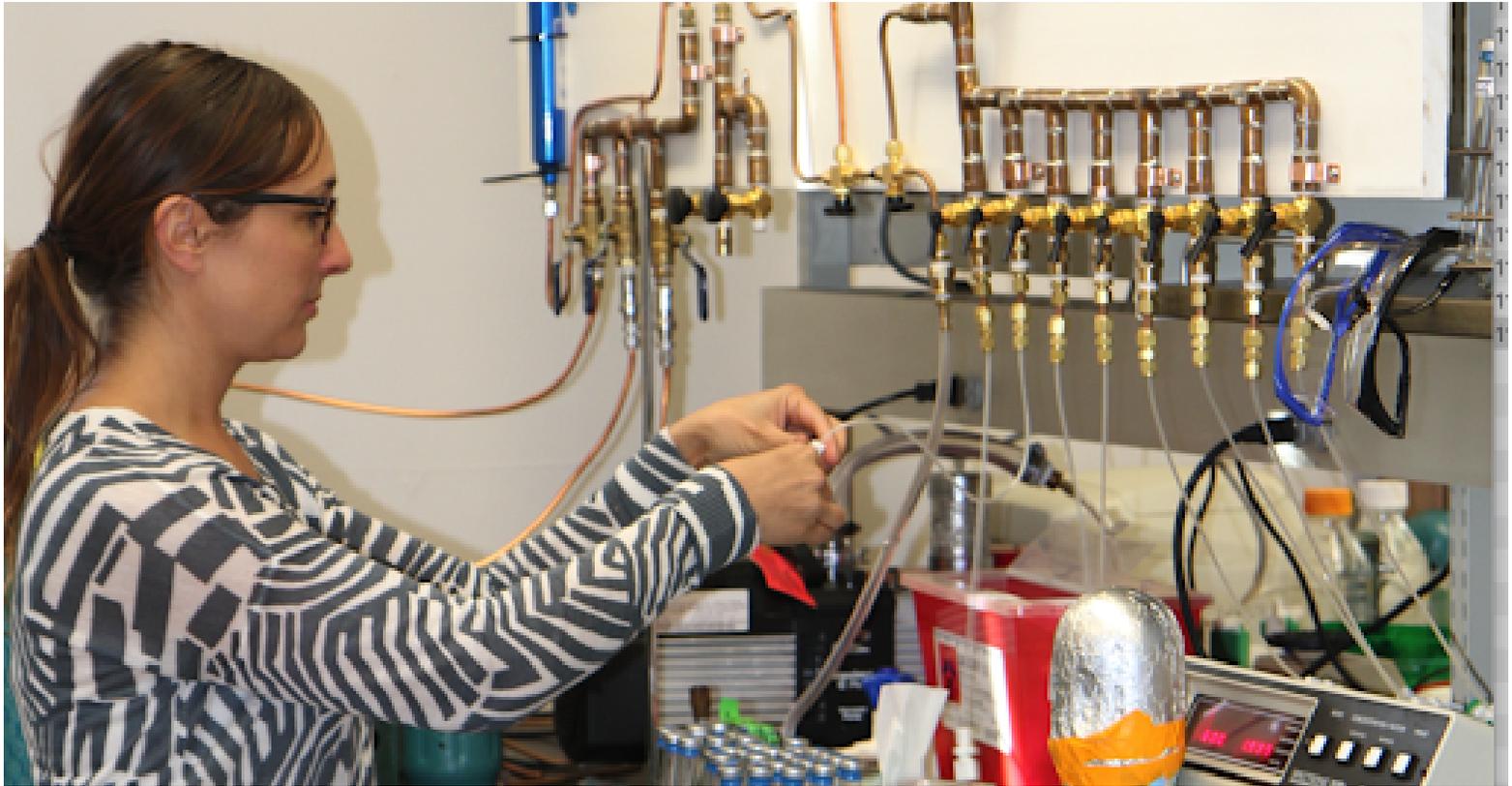


Jutras was recognized for making new discoveries in the area of the bacteria cell wall biosynthesis. Researchers in the Jutras Lab discovered that the bacterium that causes Lyme disease has a highly unusual modification in its protective molecular bag - its peptidoglycan, which is common to all bacteria. The change in this bacterium is unprecedented and is an unusual sugar modification that is not known to occur in any organism.

For unraveling the role of anaerobes in climate change and other biological processes, Allen was also recognized. In 2021, Allen discovered the first instance of living organisms producing elemental carbon in an interdisciplinary, collaborative project with researchers at Virginia Tech, the University of Bremen, and the Max Planck Institute for Marine Microbiology. Their research revealed that two kinds of microorganisms - methanogens and anaerobic methanotrophs - are able to produce a form of elemental carbon known as amorphous carbon. The discovery defies all previous expectations of what microorganisms can do, and sheds scientific light on some very interesting questions.

FACULTY AND STAFF SPOTLIGHTS

Researchers discover the first instance of living organisms producing elemental carbon



Carbon is the building block of all known life on our planet. The carbon cycle regulates the release and absorption of carbon from a number of natural sources – including the ocean, soil, geochemical processes, and human emissions – to maintain a delicate balance of this crucial element in our world. An increase in carbon dioxide and methane in the atmosphere is partly responsible for the adverse effects of climate change experienced in Virginia and throughout the world.

New research at Virginia Tech, the University of Bremen, and the Max Planck Institute for Marine Microbiology has revealed that two kinds of microorganisms - methanogens and anaerobic methanotrophs - are able to produce a form of elemental carbon known as amorphous carbon. For researchers who study methanogens and anaerobic methanotrophs, the discovery defies all previous expectations of what microorganisms can do, and sheds scientific light on some very interesting questions. Why and how are these microorganisms making amorphous carbon? Is amorphous carbon being produced in large enough quantities to affect the carbon cycle on Earth?

“We never thought that amorphous carbon could be produced by living organisms because of the normally extreme chemical reactions that are needed to form it,” said Robert White, an emeritus professor of biochemistry in the College of Agriculture and Life Sciences. “This is the first report of amorphous carbon being produced by any organism on Earth, and we are very interested in the possible implications it may have for the carbon cycle.”

Their findings were published in the American Association for the Advancement of Science's open access multidisciplinary journal, *Science Advances*. Amorphous carbon is a form of elemental carbon that lacks the hard, crystalline structure of graphite or diamond. The substance is usually formed under extreme temperatures and pressures, or during the burning of organic matter. One place where amorphous carbon can be found is in your fireplace in the winter. When you burn firewood, the intensity of the heat creates a reaction that disintegrates the wood and leaves behind an ashy, black soot. That residual substance contains amorphous carbon. Methanogens, or methane-producing microorganisms, have long piqued the interest of scientists because of their role in producing and releasing methane, a potent greenhouse gas, into the environment.

The microorganisms thrive in areas with high amounts of decayed organic matter and low-oxygen, such as wetlands, landfills, and cow stomachs. As these microorganisms eat the breakdown products of organic matter, they produce methane. The methane produced by these methanogens accounts for 90 percent of biologically produced methane, with 31 percent of this coming from cows alone. Over the years, methanogen researchers have noticed little black specks forming inside their bacterial cultures during experiments. They had hypothesized that the specks were iron sulfide, another black material that is commonly formed in methanogenic growth media. In other experiments with anaerobic methanotrophs, researchers found even more black material. Anaerobic methanotrophs are microorganisms that also thrive in the low-oxygen areas, but instead prefer the ocean floor. As they consume the methane that is seeping from the ocean floor, they convert it into carbon dioxide.

“I've always wondered, as have a number of other methanogen experts, what this black material is,” said Kylie Allen, the lead author on the study and an assistant professor of biochemistry in the College of Agriculture and Life Sciences and affiliate faculty of the Fralin Life Sciences Institute. “We used to think it was iron sulfide deposits in methanogenic cultures, but anaerobic methanotrophs produce far more of this black stuff.”

Read the full story in our Newsroom on our website.

FACULTY AND STAFF SPOTLIGHTS

GlycoMIP celebrates grand opening of national user facility



The most abundant biological materials on our planet are composed of carbohydrates. These glycomaterials are integral to our daily lives and part of the field of study known as glycosciences.

To accelerate glycomaterials research in the United States, in 2020, the National Science Foundation (NSF) awarded nearly \$23 million to a new multi-university partnership, jointly led by Virginia Tech and the University of Georgia, that will bring together leading scientists and engineers from those institutions, as well as Brandeis University, Rensselaer Polytechnic Institute, and the University of North Carolina at Chapel Hill, to establish a national glycomaterials research hub. The new research hub, called GlycoMIP, will address nationwide bottlenecks in glycomaterial synthesis, computer modeling, material characterization, and knowledge sharing through groundbreaking research and a unique national user facility that will provide critical tools and services to the scientific community.

GlycoMIP supports research on both natural and artificial glycomaterials through a unique national user facility with state-of-the-art instrumentation housed in the Fralin Life Sciences Institute at Virginia Tech and the Complex Carbohydrate Research Center (CCRC) at the University of Georgia. The GlycoMIP team recently celebrated the grand opening of its national user facility with ribbon cutting ceremonies in February at Virginia Tech and at the University of Georgia.

The GlycoMIP user facility houses two automated glycan synthesizers from GlycoUniverse and is the only facility in the country able to provide on-demand glycan synthesis and characterization. Other instrumentation of note are two state-of-the-art mass spectrometers, two vibrational optical activity spectrometers, and a microfluidic-based surface plasmon resonance instrument.

Other research facilities accessible to users of the GlycoMIP user facility include the Virginia Tech Materials Characterization Lab and Nanoscale Characterization and Fabrication Lab and the CCRC's NMR facility. "Bridging the gap between glycobiology and materials research can only occur if the tools and resources needed for both endeavors are co-housed and consistently supported. The Materials Innovation Platforms, or MIPs, established by the NSF, allow that to occur. It is an exciting time for glycan-based research," said Rich Helm, associate professor of biochemistry, director of the GlycoMIP User Facility at Virginia Tech, and director of Core Services at the Fralin Life Sciences Institute.

"The GlycoMIP user facility is part of the Materials Genome Initiative, an effort where data sharing, tool and community development are emphasized," said Dan Sui, senior vice president of Research and Innovation at Virginia Tech. "This is a great opportunity to develop and advance technologies that will provide benefits to our local community, state, country, and the world. I am excited to see GlycoMIP flourish."

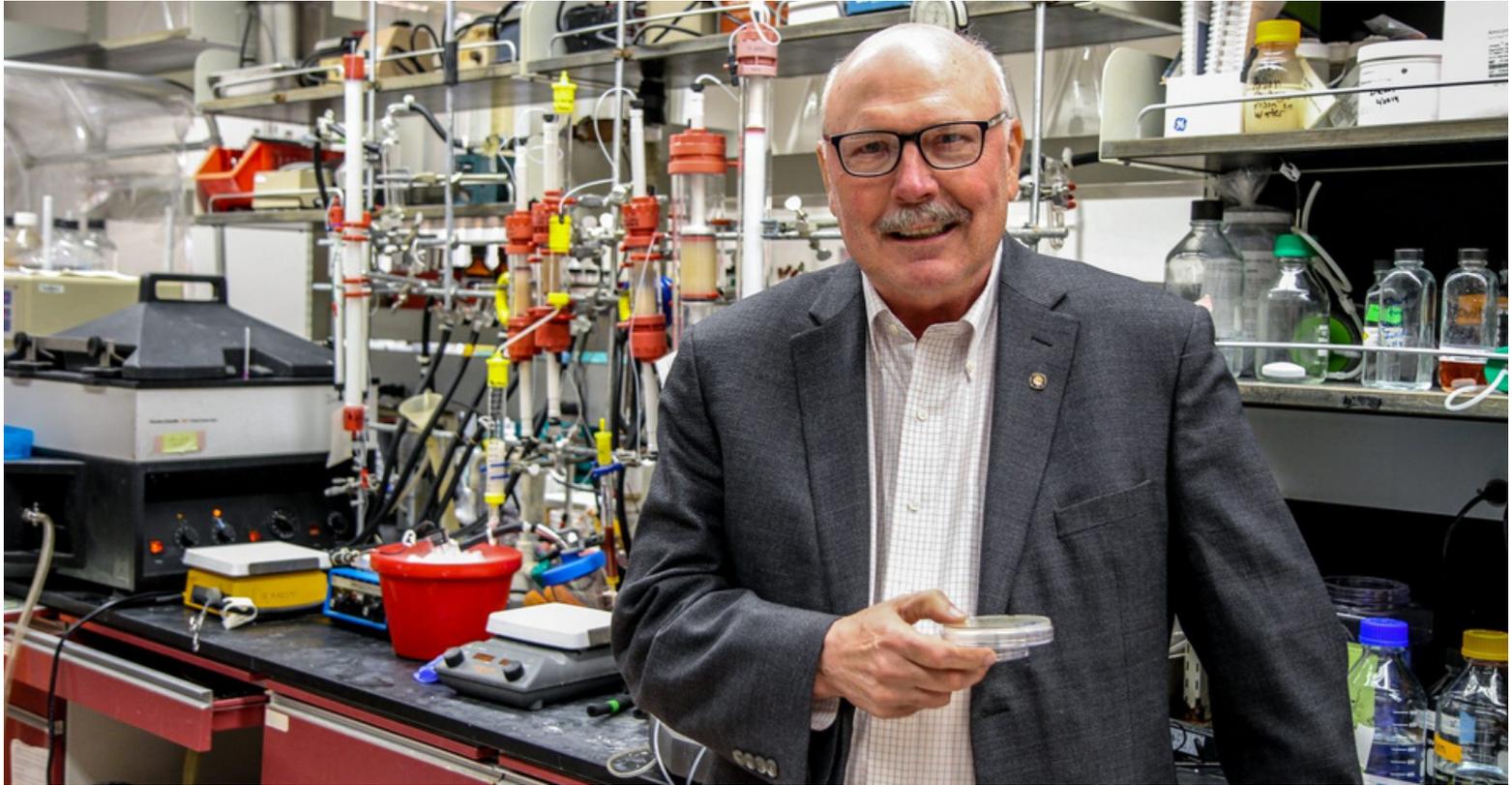
Read the full story in our Newsroom on our website.



GlycoMIP houses the only two commercially available Automated Glycan Assembly instruments in the United States. The Glycoconeer instruments can rapidly produce glycans and help drive the field of glycoscience forward.

FACULTY AND STAFF SPOTLIGHTS

Dennis Dean honored as fellow of the American Society for Biochemistry and Molecular Biology and elected new member of the Virginia Academy of Science, Engineering, and Medicine



Dennis Dean, University Distinguished Professor of biochemistry and founding director of the Fralin Life Sciences Institute at Virginia Tech, was elected as the newest member of the Virginia Academy of Science, Engineering, and Medicine.

"I was surprised and honored by the news. Our institute has worked closely supporting Virginia Academy of Science, Engineering, and Medicine programs over my career, but I was not expecting to be elected. I am pleased to be recognized with the other key scientific leaders in the commonwealth," Dean said.

Dean's election to the academy was announced in November 2021. He was one of five individuals elected to membership. Members of the academy represent key leaders in the science, engineering, and medical community across the commonwealth. With more than 200 research articles published on metals in health and disease, biological nitrogen fixation, and assembly of metal containing cofactors, Dean's research has had a profound and universal contribution to the field of study concerning cellular metabolism.

"Dennis has made paradigm-shifting discoveries that define the biological basis for iron-sulfur cluster formation. He discovered that both simple and complex iron-sulfur clusters, necessary to sustain life on earth, are pre-assembled on protein scaffolds, and also discovered the mechanism for sulfur trafficking in cells," said X.J. Meng, interim executive director of the Fralin Life Sciences Institute. "These discoveries have had profound impact on the fields of microbial biology and biological sciences in general. Dennis' work has been highly cited by his peers with more than 23,390 citations and an h-index of 88."

Dean was also honored as a fellow of the American Society for Biochemistry and Molecular Biology (ASBMB) for his efforts to advance the molecular life sciences through sustained outstanding accomplishments in areas such as scientific research, diversity, education, mentorship, and service to the scientific community.

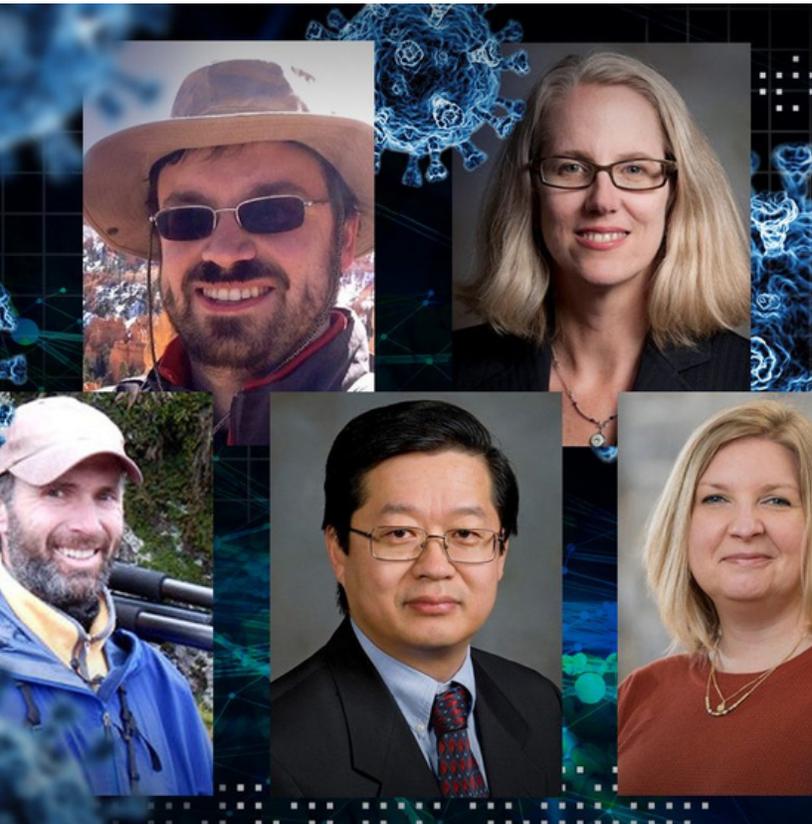
In February 2022, Dean has made these outstanding contributions to microbiology and biochemistry, using genetic and biochemical approaches to understand fundamental microbial processes. Dean's academic appointment is in the Department of Biochemistry within the College of Agriculture and Life Sciences, and his research team focuses on enzymes that assemble iron-sulfur clusters, cofactors that are important for life-sustaining processes such as nitrogen fixation, photosynthesis, and respiration.

Selection as a fellow of the American Society for Biochemistry and Molecular Biology is an honor bestowed on ASBMB's most distinguished members. Fellows are recognized for their contributions to the American Society for Biochemistry and Molecular Biology as well as meritorious work to advance the molecular life sciences.

"When I was a graduate student, we all aspired to get our work published in the Journal of Biological Chemistry. Since then, our group has published our best and most highly-cited work in that ASBMB journal, so this recognition is indeed a cherished honor for me," said Dean

Read both articles in our Newsroom on our website.

FACULTY AND STAFF SPOTLIGHTS



TACKLING THE COVID-19 PANDEMIC IN INTERDISCIPLINARY CLASSROOMS

Rarely has one aspect of daily living escaped the COVID-19 pandemic. This global event is very personal. So personal that people want to know more about the looming, ever-changing virus. Good information, though, is not always clear and accessible. Faculty at Virginia Tech have offered in-depth classes specifically about the COVID-19 pandemic.

The class covered topics across disciplines, both biological and societal. From spike proteins to the history of pandemics, more than 60 undergraduate students received broad information about the pandemic.

In the 2020 spring semester, Glenda Gillaspay, professor from the Department of Biochemistry in the College of Agriculture and Life Sciences and affiliated faculty member of the Fralin Life Sciences Institute, led the second half of a graduate class just as the pandemic began.

“One of the things I was trying to do was put together what we were going to do in the second half and maybe touch on some more practical things – real-world issues and problems that biochemistry addresses,” said Gillaspay, an affiliated faculty member of the Translational Plant Sciences Center. “And so that’s what we did. We read the papers on COVID-19. It was really impactful talking about that in a class as it was unfolding”

COLLABORATIVE RESEARCH LEADS TO POTENTIAL IDENTIFICATION OF SARS-COV-2 HUMAN EMERGENCE AND NEW COVID-19 THERAPEUTICS

Through collaboration that incorporates the use of computational modeling, data, and virology, a group of Virginia Tech researchers tackles the latest questions surrounding COVID-19. The group’s project in COVID-19 human adaptation and transmission, “A selective sweep in the Spike gene has driven SARS-CoV-2 human adaptation,” was published in *Cell*. Now, the team is building on that research for therapeutic discovery.

In 2020, prior to the beginning of the pandemic, Anne M. Brown, assistant professor of biochemistry and University Libraries’ science informatics consultant and health analytics coordinator, and James Weger-Lucarelli, assistant professor in the Virginia-Maryland College of Veterinary Medicine’s Department of Biomedical Sciences and Pathobiology, were analyzing mutations in the Mayaro virus, which causes severe arthritis in humans.

“We were interested in understanding how Mayaro virus might adapt to mosquitoes that commonly bite humans and are abundant in tropical areas,” said Weger-Lucarelli. “Dr. Brown is capable of analyzing how viral mutations impact the structure of proteins, which might impact their ability to infect their target cells. When the COVID-19 pandemic hit the U.S., we saw a natural extension of our previous work with SARS-CoV-2.”



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

FACULTY AND STAFF SPOTLIGHTS



RESEARCHERS DISCOVER A UNIQUE BACTERIAL PROPERTY, POTENTIAL TARGET FOR TREATING AND DIAGNOSING LYME DISEASE

You don't have to go far to find ticks. Just step outside and look for some grass. Look to the top of the shiny, green blade - usually ankle high. A tick might be there, waiting.

If something breathing brushes up against grass, the tick takes something similar to a needle - called its hypostome, which has dozens of fishing hook barbs - and inserts it into the skin. If unnoticed, Lyme disease could be transferred to its host after about 24 hours of feeding.

Virginia Tech researchers discovered that the bacterium that causes Lyme disease has a highly unusual modification in its protective molecular bag - its peptidoglycan, which is common to all bacteria.

The change in this bacterium is unprecedented. It's an unusual sugar modification that is not known to occur in any organism. One way the bacterium gets this sugar modification is from ticks by absorbing a carbohydrate unique to ticks. The alteration is specific to ticks and allows the bacterium to better move and be more likely to cause disease.

"We believe this change is critical to how the bacterium causes disease and is something that we can exploit for both therapeutic and diagnostic purposes," said Brandon Jutras, an assistant professor of biochemistry.

"Partaking in this research was the most engaging and rewarding experience of my academic career at Virginia Tech," said lead author Tanner DeHart '20 and '21, who earned his undergraduate and master's in biochemistry at Virginia Tech and is now a Ph.D. student at Harvard University. "This opportunity allowed me to hone my scientific skill-set, develop as a more independent researcher, and obtain first-hand experience with many experimental techniques and designs."

RESEARCHER RECEIVES GRANT TO DEVELOP IMPROVED LYME DISEASE DIAGNOSTICS AND THERAPEUTICS

Lyme disease is carried by black-legged ticks and infects people when they are bitten and transmit the bacterium *Borrelia burgdorferi*. Black-legged ticks are especially common in the northeastern United States, and people are exposed to the ticks usually during outdoor activities. Warming temperatures and climate change have caused tick populations to explode and infiltrate more areas of the country, increasing the chance of getting the disease.

The Centers for Disease Control and Prevention estimate that 476,000 people are infected with Lyme disease every year in the United States.

Early symptoms of Lyme disease are fever, headache, fatigue, and the possibility of a telltale bullseye rash at the bite site. If left untreated, the infection can spread to the joints, heart, and nervous system and cause debilitating long-term conditions including Lyme arthritis, carditis, and neuroborreliosis. Sometimes patients can still develop these symptoms despite proper therapy.

Brandon Jutras, assistant professor in the Department of Biochemistry in the College of Agriculture and Life Sciences, received a grant from the Global Lyme Alliance to improve diagnostic testing for all stages of Lyme disease and to develop new ways to treat patients when conventional treatment options have failed.

"Late-stage complications of Lyme disease are due to how our immune system responds. With this funding, we are now able to test new ways to prevent our immune system from overreacting," said Jutras.



"In a very short amount of time, Dr. Jutras has developed an impactful research program that engages several Virginia Tech students in Lyme disease research," said Glenda Gillaspay, professor and department head of biochemistry in the College of Agriculture and Life Sciences. "Together, Dr. Jutras and his team are poised to use biochemical and molecular techniques to help innovate this field, and this recent award will provide significant and important support for the work."

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

DONOR GRATITUDE

Biochemistry enhances experiential learning for students with investment in two state-of-the-art scientific instruments



With an investment in two automated scientific instruments, the Department of Biochemistry, which is in the College of Agriculture and Life Sciences, is bringing state-of-the-art industry technology into the classroom to bolster student experiential learning. With help from generous gifts, including from Virginia Tech's 2021 Giving Day, an open-source liquid handling robot and a qPCR machine allow the department to further train and prepare students for their careers in the industry.

Despite how ordinary automation is in the industry, it's unusual in university research labs or teaching lab settings. It's far more common for students to perform research tasks by hand and the prevalence and significance of automated technology are often lost on students, as upfront costs are high.

Biswarup Mukhopadhyay, a professor of biochemistry, saw the robot as a great opportunity to introduce an automated system in a research lab setting, where both undergraduate and graduate students can be trained in popular industry technology. With this goal in mind, Mukhopadhyay recruited Colin Short, an undergraduate biochemistry student from his lab, to develop and write protocols for the robot during the summer of 2021.

Jim Tokuhisa, assistant professor of practice in biochemistry and biological sciences, intends to use the robot in conjunction with the qPCR machine. A qPCR machine measures the synthesis of DNA in real-time and has been used most recently in health districts across the country to conduct PCR tests for coronavirus. Researchers use the qPCR machine to count the number of copies of the SARS-CoV-2 virus in an individual from a nasal swab to determine if a person is infected. More commonly, though, researchers use qPCR machines to quantify the mRNA of a gene or protein of interest.

Both instruments will be used in future experiments in research labs across the department as well as in teaching labs to show students real-world examples of automated systems within the scientific industry. Tokuhisa and Mukhopadhyay will showcase both instruments in the department's capstone laboratory course that all biochemistry majors have to take before graduating.

"I think it's very beneficial for students to use something similar to what is used in industry," Short said. "If they're exposed to these kinds of instruments, they can walk into a potential career opportunity and feel more confident because they've seen these things before."

Read the full story in our Newsroom on our website.

Giving Day this year took place on February 23-24 from noon-noon, until Virginia Tech received so many donors that the Giving Day dashboard couldn't handle it anymore! Thus, Giving Day activities continued until the end of day on February 24 and we had 59 donors support the Department of Biochemistry. We also met our department challenge, which unlocked an additional \$1,200 amount for the Department Annual Fund from Glenda Gillaspay, Timothy Larson, and Ray Hetherington '83! We wanted to take the time to say thank you to all of our donors. 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 the Virginia Tech Department of Biochemistry 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 enables 5 students to participate in our annual EngelPalooza student research showcase event, which all alumni are invited to attend, in person or virtually!*
- *A \$100 gift contributes to bringing recent alumni speakers to campus who talk about their career paths and novel ways to use a Biochemistry degree.*
- *A \$1,000 gift funds a graduate/undergraduate student mentoring award, allowing our graduate students to gain mentoring skills by directing the work of an undergraduate researcher, who gains critical research skills.*

MAKE A GIFT TODAY BY VISITING WWW.BIOCHEM.VT.EDU/GIVING