

COLLEGE OF SCIENCE DEPARTMENT OF BIOCHEMISTRY AND BIOPHYSICS

CATALYST

Moving Forward Together

SUMMER 2021



Oregon State
University

CATALYST

Summer 2021

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Research News

On the cover — A stained glass portrait of a bacteriophage (bacteria-killing virus), entitled "A Look at Phages through Rose Tinted Glasses," by Madeleine (Maddi) McArthur ('21), from Associate Professor Phil McFadden's Protein Portraits class.



From the Head

Elisar Barbar

Greetings, faculty, students, alumni and friends—

As we approach the post-COVID era and start to see the beginning of the end of a dark event in history, I am pleased to report that the state of the department is strong. Although nothing would have prepared me to lead the department through this once-in-a-century pandemic, a year and a half later, we are still here, stronger and smarter and, I might add, more forward thinking and productive.

The pandemic forced us to conduct our operation remotely, but it also reminded us that we are all in this together. Importantly, it brought issues of race, gender, mental health and economic disparities to the forefront, forcing us to address them and openly advocate for diversity in all of its forms.

In this past year I have depended on the flexibility of many people, from changing

their teaching assignments or adding to their teaching load, to coming to the lab masked with no water and no food and still excited to be there.

I want to congratulate the classes of 2020 and 2021 for reaching the finish line amidst the pandemic. This past year and a half has not been easy. Remote learning is isolating, and requires self-motivation, discipline and grit. Students had to find new ways to experience what a university is about: Exchanging ideas through in-person interactions with faculty and students. We are proud that our department is one of the very few on campus that delivered in-person lab classes, where students actually pipetted, isolated DNA, grew cells and purified proteins, and talked to faculty and fellow students face to face.

We also provided opportunities for many students to be involved in our research labs that stayed open during the pandemic. They provided help on

our projects, including work on SARS-CoV2, mechanisms of aging and cancer research and the development of new technology that pushes the field.

I also want to acknowledge the hard work of our faculty and graduate students during this period. I am proud of all the extra effort and the sacrifices we made to deliver top quality experiences.

Despite these circumstances, this has been a record year of funding and visibility. Faculty and students gave Zoominars at national meetings and brought in NIH, NSF and USDA funding. We also realized more than ever the role that science plays in people's lives, from educating about viral transmission and vaccines to the importance of basic science research.

On this front, the department developed a summer class on viruses for high school students. My lab also expanded to work on the coronavirus nucleocapsid, a collaboratively-funded work from several BB faculty that also gave us a huge opportunity to reach out to the public through TV interviews, podcasts and dance.

In spite of COVID, or perhaps because of COVID, we are a stronger department, one that cares and is pulling together. We are becoming more open-minded and willing to listen to each other and take constructive criticism. And we continue to be passionate about what we do: Revealing how life works for the benefit of all.

—Elisar Barbar



We acknowledge that Oregon State University in Corvallis, OR is located within the traditional homelands of the Mary's River or Ampinefu Band of Kalapuya. Following the Willamette Valley Treaty of 1855 (Kalapuya etc. Treaty), Kalapuya people were forcibly removed to reservations in Western Oregon. Today, living descendants of these people are a part of the Confederated Tribes of Grand Ronde Community of Oregon (grandronde.org) and the Confederated Tribes of the Siletz Indians (ctsi.nsn.us)

Best & Brightest

Faculty updates

Assistant Professor
María Franco



Congratulations!

María Clara Franco was hired as a tenure-track faculty member. She joined the department in 2017 as a research assistant professor. Her research focuses on elucidating the role of reactive nitrogen species in redox signaling in tumors of the nervous system. Recently, Franco was elected to the Society for Redox Biology and Medicine Council (SfRBM). In this leadership position, Franco will contribute to shaping the future of the Society. She also chairs the SfRBM Regional Meetings Committee, and is a member of the newly instated Ethics Committee.

Despite the pandemic shut down, members of the department continued their research, explored new ideas and received numerous college, national and international recognitions.

Professor **Michael Freitag** was honored with the 2021 F.A. Gilfillan Award for Distinguished Scholarship in Science. The Gilfillan award is the highest honor given to a faculty member in the College whose scholarship and scientific accomplishments have extended over a substantial period of time. A renowned molecular geneticist, Freitag's research focuses on how genome defense systems and epigenetic silencing phenomena shape and maintain eukaryotic genomes and epigenomes.

Freitag was elected an AAAS Fellow in 2018 for contributions to fungal genetics and genomics. Additionally, he was named a Fellow of the American Academy of Microbiology and received the 2014 Beadle and Tatum Award, given by the worldwide fungal research community to just one scientist every other year. His ground-breaking

discoveries on fungal epigenetics and chromosome structure research appeared in *Nature*, *Science*, *PNAS* and other prestigious journals.

Senior Instructor **Kari van Zee** won the Frederick H. Horne Award for her exceptional qualities as a teacher and mentor. This award is named after Fred Horne, OSU Professor Emeritus of Chemistry and the former College of Science Dean for 13 years, from 1986 to 1999. Horne sadly passed away on April 21, 2021.

Van Zee is consistently named a favorite instructor, advisor and mentor to our students. During this past year of remote learning, van Zee went above and beyond to modify her lab space to allow for in-person instruction while complying with safety protocols (see **p. 8**). Hers was one of the very few on-campus learning experiences available.

Instructor **Lauren Dalton** was selected as an Ecampus Fellow and awarded funding for her project, "Pacing Online Learning: The Impact of Video Segmentation on Conceptual

Development." Dr. Dalton developed this project in conjunction with a team of College of Science and College of Agricultural Sciences instructors, including Jeremy Rose, Caity Smyth, and Katie Jager. "Our goal is to understand how the video length and activities within videos help students understand biological concepts," says Dr. Dalton. "This will have wide-reaching impacts and influence how our online courses in the department, and likely across OSU, can be designed to maximize student success."

Professor **Ryan Mehl** and Research Assistant Professor **Rick Cooley**, Associate Professor Weihong Qiu, and Chris Cebra and Shay Bracha from OSU's Carlson College of Veterinary Medicine received a \$75K SciRIS award in 2020 for their project "Chemically Functionalized Nanobodies." The researchers plan to engineer nanobodies – very small reactive parts of a unique antibody found only in the blood of sharks, camels, llamas and alpacas – to bind cancer-causing proteins, leading to better diagnosis and treatment of cancer.

The Disease Mechanism and Prevention Fund (DMPF) award from the College of Science went to **Adrian Gombart**, professor of biochemistry and biophysics and principal investigator in the Linus Pauling Institute (LPI). The project entitled, “Role of the Cathelicidin Antimicrobial Peptide in the Development of Alzheimer’s Disease,” includes LPI colleagues **Tory Hagen**, professor of biochemistry, and Kathy Magnusson, professor in veterinary medicine.

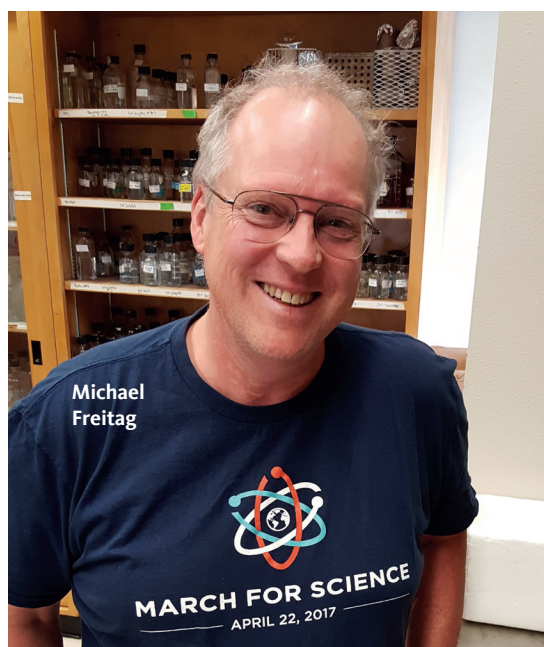
In addition, three interdisciplinary teams comprising biochemistry and biophysics faculty received Science Research & Innovation (SciRIS) awards from the College of Science. Associate Professor **Victor Hsu** and Chris Beaudry, professor of chemistry, along with Siva Kolluri, cancer researcher in the College of Agricultural Sciences received \$125K to research analogs of homoharringtonine, a plant alkaloid isolated from plum yew, with improved pharmaceutical properties.



Fond farewell

After nearly nine years with the department and as a member of the LPI, **Viviana Perez** left OSU in 2020 for a position as a program officer in the NIH’s National Institute on Aging.

Viviana joined OSU as an assistant professor in 2011 and built a very strong, internationally recognized research program on aging. She was later promoted to associate professor of biochemistry and biophysics. She was a wonderful colleague, mentor, a great collaborator and a productive member of both the BB department and the LPI’s Healthy Aging Program. Perez served as the chair of the undergraduate committee that oversaw the establishment of the Biochemistry and Molecular Biology program, served on the executive committee and received several prestigious national awards. While we are greatly saddened to lose an amazing colleague in Viviana, we are happy for her move into a leadership position at NIH to take her great passion for aging research in a new direction.



Michael
Freitag



Kari
van Zee



Ryan
Mehl



Rick
Cooley



Victor
Hsu

On the Move

Students going above and beyond



Fulbright Awardee
Isabella Karabinas



Fulbright Awardee
Maja Engler



Goldwater Awardee
Emily Gemmill



Goldwater Awardee
Alyssa Pratt

UNDERGRADUATES Biochemistry students strike Gold[water]

Two students in our department – out of four total at OSU! – received 2021 Goldwater awards, the top undergraduate award in the country for sophomores and juniors in the fields of science, technology, engineering and mathematics (STEM).

Alyssa Pratt, a second-year Honors student, is double majoring in computer science and biochemistry and molecular biology. She studies RNA secondary structural features called hairpin loops with a wide variety of functions, primary among them being the potential to arrest disease-associated genes, in the lab of David Hendrix.

Emily Gemmill is pursuing a double major in biochemistry and biophysics and mathematics. Employing interdisciplinary research methods, Gemmill probes the mysteries of protein-based molecular motors called kinesins in the Weihong Qiu Lab.

In Spain and Germany, exploring their world

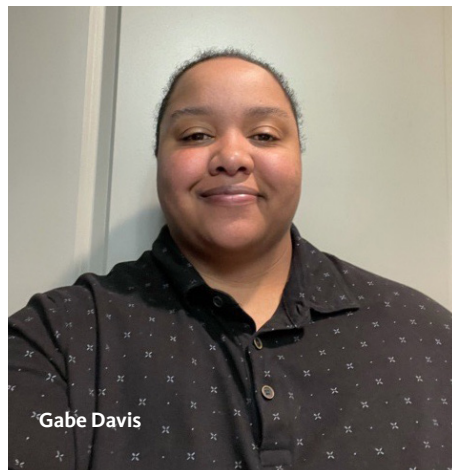
Our department was home to two Fulbright Award winners in 2020 and 2021. Last year, Honors biochemistry & biophysics and psychology double major **Isabella Karabinas** was one of three OSU students chosen for the prestigious scholarship, which funds opportunities to study, conduct research and teach abroad for one academic year. She is currently

studying neuroscience at Universidad Complutense de Madrid.

A highly recognized scholar, Karabinas received the Goldwater Award in 2019. She also received the College of Science Merrill Family Foundation scholarship. She plans to pursue an M.D./Ph.D. to become a practicing neurologist or psychiatrist.

Honors biochemistry and molecular biology major **Maja Engler** received the Fulbright Award in 2021. In September, she will move to Germany where she will research winter polymorphisms in hibernating Djungarian hamsters at Ulm University to understand better potential biomedical applications for humans. “I am so excited to make

strong connections and discover new perspectives within my field of science in Germany, a country known for its commitment to promoting global citizenship,” she said.



HP community scholarship

Gabe Davis, a sophomore BMB major, received the first annual HP Community STEM Scholarship, a merit-based award for underrepresented minorities. The \$10K scholarship supports students pursuing a degree in STEM fields.

Davis has been doing research with Christine Kelly, associate professor in the College of Engineering, on a project to detect traces of the SARS-CoV2 virus in wastewater systems.

Broad dreams

Honors graduate **Diego Rodriguez** ('20) was selected for a highly competitive summer research program at the Broad Institute of MIT and Harvard in 2019. After graduation, he returned to the Broad Institute to pursue a two-year research associate position with his former PI Bill Sellers, director of the institute's cancer program.

Rodriguez is the recipient of several College of Science scholarships, including the George & Marthel

Porter Premedical scholarship, Merrill Family Foundation scholarship, and the Vernier Program Mentor & Diversity (Promise) scholarship.



Prestigious research internship opens new possibilities

Michael Kupperman ('20) loves to do research “at the interface of mathematics and biology, focusing on probability theory and dynamics” – a deep interest the Honors student has explored as a double major and as a 2019 Science Undergraduate Laboratory Intern at Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico. LANL is one of the largest science and technology institutions in the world, conducting multidisciplinary research in fields such as national security, space exploration, nuclear fusion, renewable energy, medicine, nanotechnology and supercomputing.

“Los Alamos opened my mind to considering national laboratory research and employment. It's a unique type of place, somewhat removed from industry-specific pressures, but offering a bit more structure than a university research environment.” Today, Kupperman is in a Ph.D. program at the University of Washington's Department of Applied Mathematics.

2020 CURE and SURE Scholars

Twenty-three students participated in summer research projects as Cripps Undergraduate Research Experience (CURE) and Summer Undergraduate Research Experience (SURE) scholars. The pandemic led to restrictions that limited lab space on campus, so some projects shifted to enable them to continue from home, and others extended their research through May 2021. Congratulations!

CURE SCHOLARS

Michael Devine (Michael Freitag)
Molly Thibado (Michael Freitag)
Ilana Gottfried-Lee (Richard Cooley and Ryan Mehl)
Kitty Liu (Adrian Gombart)
Megan Jones (Adrian Gombart)
Grace Scuderi (Tory Hagen)
Gautam Singh (Alvaro Estevez)
Audrey Korte (Weihong Qiu)
Seth Pinckney (Elisar Barbar)
Peter Do (Weihong Qiu)

SURE SCHOLARS

Dustin Campbell (Massimo Bionaz)
Emily Gemmill (Weihong Qiu)
Joshua Griffis (Richard Cooley)
Toren Ikea-Mario (Tory Hagen)
Chapman Kuykendall (Colin Johnson)
Maya Livni (Maude David)
Christopher Markgraf (Susanne Brander)
Jacob North (Victor Hsu)
Reina Paez (Lia Danelishvili)
Danielle Sanchez (Ryan Mehl)
Kaytlin Wearne (Kenton Hokanson)
Devin Wright (Michael Freitag)
Lisa Zhivaya (Maude David)



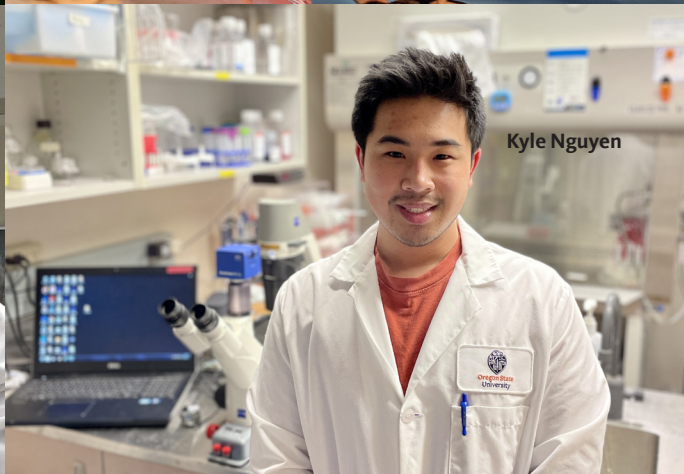
Heather Masson-Forsythe



Brittany Lasher



Kayla Jara



Kyle Nguyen



Lillian Padgitt-Cobb

GRADUATE STUDENTS Awards and honors

Congratulations to Ph.D. Candidate **Heather Masson-Forsythe** for winning Science Magazine's 2021 Dance Your Ph.D. contest and being featured in *Science*, NPR and *Forbes*. Masson-Forsythe won the award in the COVID-19 category for her work titled, "Biochemical & biophysical studies of the COVID-19 nucleocapsid protein with RNA." A talented creator on TikTok (@heycurllytop), she uses dance to make science more accessible to all. "Lots of people respond to and better understand scientific concepts when you can incorporate them into an art setting, especially dance; it gives you a different platform to tell a story. And

telling stories is a lot of what science is supposed to be about."

With nearly 50k followers, her approach seems to be working. Masson-Forsythe also received the College of Science Inclusive Excellence Award for her contributions to many equity, justice and outreach programs that have brought recognition to both the biochemistry department and Oregon State.

Brittany Lasher was selected as the 2020-21 Christopher and Catherine Mathews Graduate Fellow. Lasher works in David Hendrix's lab where she studies computational biochemistry. The fellowship is named for Chris Mathews, an

emeritus distinguished professor and BB department chair from 1978 to 2002, and his wife Kate Mathews.

With glowing reviews from students and faculty alike, Ph.D. student **Kayla Jara** received the coveted Herbert F. Frolander Graduate Teaching Assistant Award in 2020. The award recognizes graduate students who have excelled in their capacity as teaching assistants.

Kyle Nguyen, a second-year Ph.D. student in María Franco's lab, received an SfrBM award and was selected to present an oral presentation. He was also featured in ASBMB Today magazine for his work researching

glioblastoma multiforme, a type of brain cancer. He presented his work at the 2021 ASBMB Annual Meeting.

Rachel Franklin was appointed to serve on both the Family Resource Center advisory board and the College of Science Dean's Advisory Council for the 2020-2021 year.

Lillian Padgitt-Cobb, along with PI David Hendrix, received a USDA graduate fellowship for a project entitled: Chromosome-level assembly and genomic data science to reveal insights about cone development, disease resistance, and the evolutionary history of hops (*Humulus lupulus*).

Newly minted

Padideh "Medisa" Danaee earned her Ph.D. in the Hendrix Lab in December 2019. Medisa was a computer science graduate student who worked on applying machine learning to the classification of biological data. One of her projects applied deep learning to distinguish cancer from healthy cells and received over 200 citations. She

is currently a senior data scientist at Alignment Healthcare.

Also in computer science, **Dezhong Deng** worked in the Hendrix Lab and completed his Ph.D. in December 2019. Dezhong worked on several projects related to RNA structure and helped create a linear-time structure prediction algorithm. He also developed deep learning algorithms to detect RNA hairpins from sequence alone. He now works as an AI research scientist at Two Sigma Investments in New York City.

Joseph C. Meeuwsen worked in the Beckman Lab and completed his Ph.D. in July 2020 on the use of mass spectrometry for better characterizing superoxide dismutase in ALS and for detecting degradation of therapeutic antibodies. He has joined the startup mass spec company e-MSion as a product specialist in Corvallis where he continues to develop his skills in mass spectrometry. In his spare time, he is exploring his interests in music and brewing beer.



Isabelle Logan completed her Ph.D. in March 2021. She worked in the Gombart Lab, researching how the dietary supplement xanthohumol can improve health. She focused on its effects on reducing obesity and metabolic syndrome using mouse models of disease. She published three papers with a fourth submitted. Isabelle received the 2017 Christopher and Catherine Mathews Graduate Fellowship from the department and the prestigious 2020 P.F. and Nellie Buck Yerex Graduate Scholarship, a university-wide award. She is currently a postdoctoral fellow in the department in Dr. María Franco's lab.

WELCOME

New graduate students



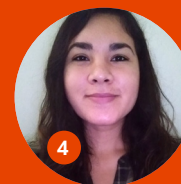
1 For the past five years, **Felisha Imholt** worked in Ken Muneoka's lab at Texas A&M where she studied digit regeneration in mammals. She presented her research at the Orthopaedic Research Society Annual Meeting in 2018 and currently has publications in *Atmospheric Chemistry and Physics* and *Wound Repair and Regeneration*.

2 First-year Ph.D. student **Sanjay Ramprasad's** research interests include protein structure



and function, enzymology, oxidative stress regulation in eukaryotic organisms and evolutionary molecular biology. Originally from Minneapolis, MN, he received his B.S. in chemistry from Portland State University.

3 Originally from Ho Chi Minh City, Vietnam, **Cat Vesely** completed her B.S. in microbiology with minors in chemistry and fermentation science at Oregon State. While an undergrad, she worked in Elisar Barbar's lab, and has decided to continue her research



interests in protein structure and function as a Ph.D. student.

4 **Monica M. Vidal-Franco** has a B.S. in Natural Sciences from the University of Puerto Rico in Cayey. Her research interests include aging metabolism, oxidative stress and proteomics.

5 **Jun Yang** is a first-year Ph.D. student who is interested in the research of aging and mitochondria, as well as bioinformatics. He received his B.S. and M.S. degrees from OSU.





Above and beyond the call of duty

Physical distancing, online learning and lots of PPE – Instructors and students adjusted to a new normal this past year.





When the COVID-19 pandemic forced people into their homes, university life changed in unprecedented ways. With very little notice, the community learned to use video conferencing platforms for teaching and learning, and faculty developed a completely new set of best practices to help students achieve their learning goals.

When it comes to lab work, though, there is just no substitute for hands-on experience. Pandemic limitations on in-person gatherings made this difficult. Nevertheless, Senior Instructor **Kari van Zee** found a way to make it work. She spent the summer of 2020 outfitting the teaching lab with safety barriers. She bought large acrylic sheets, cut them to size, and mounted them on the lab benches to provide isolated stations for the students to use.

“In addition to the usual PPE, students wore masks and gloves at all times,” said van Zee. Because the laboratory capacity was limited to 15 total persons, her plan to meet pandemic safety limits included an ingenious element: smartphone tripods. Students alternated in-person days with their lab partners, with the other partner watching via Zoom. “Team members really worked to support each other by taking on roles such as time keeper, note taker and problem solver on their remote days,” said van Zee.

Students appreciated the chance to do bench work. “I was excited to have the opportunity to attend BB494 in person during the pandemic. Dr. van Zee created a safe environment for students and instructors so that we could perform lab work,” said biochemistry and molecular biology (BMB) major **Marcus Hemshorn** ('21). “When a lab is hands-on, it allows for a greater understanding of the techniques and concepts compared to a remote environment. This course made



me realize my passion for research and helped to determine my career goals.”

Van Zee used her laboratory setup to teach in-person classes every term this year. “We relied heavily on the students to monitor their own health. If they had any COVID-19 symptoms or possible exposures, they rotated out and Zoomed into lab. The students were impressive in their concern about the health and welfare of their classmates,” she said.

Laboratory courses are not the only ones that benefit from face-to-face instruction. The department’s Scientific Theory and Practice course relies heavily on group discussions as students work together to dissect research papers and examine their place in society as future scientists. At first, that intense dialogue was difficult to imagine in a remote format, but instructors **Kate Shay** and **Lauren Dalton** brainstormed ways to make it work.

They leveraged Zoom’s breakout rooms as personal student spaces for groups to build presentations together. Moreover, the instructors encouraged students to have cameras on so that everyone could see friendly faces. Dalton said the cameras-on policy “dramatically increased the community feel of the group.”

“Our classes spend the terms working closely together. Faces and smiles help dispel anxiety and forge bonds,” added Shay.

The students also appreciated the new format. Third-year biochemistry and biophysics (BB) major **Natalie White** said, “I feel like we were a little community. I learned a lot and really appreciated the environment.”

“Having a chance to discuss with my peers, even in an online setting, definitely helped me stay engaged and better understand the material,” said BB major **Jac Longstreth** ('21).

Togetherness was important to instructors as well. “It allowed us all to take a little bit of a breath and realize we were all human and perhaps unpack how we are responding to the world and our place in it,” said Dalton.

In her Cell and Molecular Biology course, Dalton carried the thread of community even further by implementing take-home group exams. “I don’t know why I didn’t try this sooner,” she said, “because honestly, if the ultimate goal is learning, this mode of exam made their learning more robust.” In this system, students answered data analysis questions based on topics from class. They worked together in groups but were responsible for writing their own answers. “It was the best of both worlds,” Dalton said. “More learning and still students are accountable for understanding the material.”

Despite many successes, the pandemic restrictions presented students and faculty alike with new challenges. “Our students had changes in their living and working situations,” said Shay. “Some of them were quarantined alone in apartments or dorm rooms, and that



“Students who feel cared for learn more.”
Instructor Lauren Dalton



“Faces and smiles help dispel anxiety and forge bonds.”
Instructor Kate Shay



Plexiglass barriers and Zoomed-in lab partners enabled students in BB315 to still have in-person lab learning during the pandemic.

takes an emotional toll. Others moved back home, and they had additional responsibilities in helping out with the needs of family members.”

“I learned so much this year about what’s important in teaching,” said Dalton. “It turns out that students who feel cared for learn more. I added a lot more flexibility in assignments and ways to demonstrate knowledge, and I feel confident that they learned the same, if not more, in these trying times. This is a lesson for sure that I

can bring into classes I teach when we finally go back in person.”

Van Zee agreed, adding that the department has continued to feel like a community. She has plans to bring the students together when OSU guidelines consider it safe. “I realized in our spring lab for BMB majors that most of these sophomores and juniors had never met their team members in person. So, in fall 2021, we are planning a BB315 reunion so classmates can reconnect in person.”

Department News



Rachel Franklin



Tilottama Chatterjee



Nathan Waugh



Kate Shay



Afua Nyarko

Reaching out

On March 7, 2020, the department participated in an annual outreach event, “Discover the Scientist Within,” aimed at nurturing middle school girls’ interest in STEM fields. The workshop was themed around exploring the biochemistry in your kitchen. Students extracted DNA from fruit and made their own pH indicator with anthocyanin from red cabbage. The event was led by BB grad students **Rachel Franklin**, **Tilottama Chatterjee** and **Nathan Waugh**.

Kate Shay created an online intensive two-week summer course for high schoolers interested in majoring in STEM in college. Called “Biochemistry Blast for High School Students: Molecular Biology of Viral Diseases,” the course will be offered again in 2021.

In March 2020, OSU held a personal protective equipment, or PPE, drive to support our local healthcare workers. The BB department donated 30,000

gloves and 3,000 face masks to the drive. Altogether, OSU donated nearly 200,000 pairs of gloves and more than 8,000 face masks for Oregon healthcare workers.

In October 2020, Assistant Professor **Afua Nyarko** was a panelist for the College of Science’s virtual town hall. The purpose of the forum was to talk about the experiences of Black students through written and spoken testimonials.

Also in October, Assistant Professor **María Franco** served on a panel of exemplary mentors at the faculty professional development session, “Engaging Undergraduates in Research.”

Heather Masson-Forsythe (@heycurlytop) was recently featured in a blog post by Twist Bioscience discussing differences between STEM & STEAM and how young scientists are utilizing the arts to eliminate inequities in the science field.

Kevin Ahern recorded a video poem to encourage students and colleagues during the height of the pandemic shutdown:

*When this thing is finally over
some things I'm gonna do
Like walking down a sidewalk
no more avoiding you.
No masks to clean for just in case
I'll have a party at my place.
My hands can touch and rub my face.
I'll hug a friend or two.
No six foot distance rules to keep.
No frets of spray with every peep.
No nightmares when I go to sleep.
Perhaps a bar-b-que.
We'll hike with friends for miles and miles.
No curves to flatten
And, meanwhile, we'll get back to our
old lifestyle.
These things are just a few.
Yes, I'll rejoice, no more indoors,
the end of those infection scores.
Plus, toilet paper in the stores!
Hang on, and we'll pull through.*

Watch the video here: beav.es/36c



Making Us Proud

Alumni making an
impact worldwide

Carollee Woodstock's scholarship fund supports students so they don't have to juggle full time work and classes like she did.

Woodstock's Pizza owner gives back

Carollee Woodstock ('81) transferred to Oregon State University from West Virginia Wesleyan without ever having visited the campus before. "My parents had a residence in Oregon, so I could get in-state tuition," she explains.

At her old school, Woodstock was a biology and chemistry double major. "I was nerdy," she admits. Yet when she arrived at Oregon State, she was dismayed to discover that double-majoring was not encouraged at the time. Never hearing the term 'biochemistry' before, she chose that major with the hope that she would not have to pick between her two passions.

Once she started meeting with her advisor, Dr. Bob Becker, "I knew right away I was in the right place. I could take all the biology classes I wanted" while pursuing her other interest in chemistry. In addition to her classes, Woodstock worked in Donald Reed's

biochemistry laboratory and still remembers it as "a great experience." She also worked at a new pizza restaurant in town, where she met and later married its founder, Chuck Woodstock. She now runs the flagship restaurant, Woodstock's Pizza, a Corvallis landmark that celebrated its 45-year anniversary in 2020.

Her favorite part of owning the business is what she calls "legacy hires," second-generation employees whose parents also worked at Woodstock's Pizza as college students. "It's gratifying seeing people who are here... and then they go off in the world and achieve success," she said.

Woodstock endowed a scholarship fund to support biochemistry and biophysics students, supporting 14 students since its founding in 2005.

"I had to work and go to school at the same time. It put me behind for part of the year because I just couldn't

work the full 40-hour week I needed for income and also take a full course load. I had to put those courses off," she remembers.

Woodstock realizes that challenge is even greater for current students. "With tuition now, you can't work your way through school anymore. It's too expensive. I don't want students to have to put classes on hold the way I did."

A Beaver sports fan, Woodstock has also supported Oregon State women's basketball and gymnastics. "I joke with them, though. Any time I give money to them, I also have to give to the biochemistry department!"

Reflecting on her studies and the importance of biochemistry in today's world, Woodstock said "I think this past year is a really good indicator of how important science is. Specifically, in the pharmaceutical realm, which is entirely biochemistry related."



Annual support of biochemistry and biophysics

The Honor Roll recognizes the Department's annual supporters who have made outright gifts, pledge payments or new commitments totaling \$250 or more between January 1, 2020, and December 31, 2020.

Jenean Friedrich Bass '82 &

Michael B. Bass '82

Jeremy Cutsforth-Gregory '05

Ward E. Harris '62

Margaret R. MacDonald '79

Catherine Z. &

Christopher K. Mathews

Ryan A. Mehl

Christine M. '88 & Gary F. Merrill

Jill M. Mooney '00

Karen Sahlstrom Nickel-

Creusere '61

Barbara & Douglas R. Schleiger '86

Alice Burk Stormshak '81 &

Fredrick Stormshak

Vasiliki D. '79 & Zachary H.

Stoumbos

Grace Y. Sun '66

U.S. Israel Binational Science

Foundation

Karen L. & Pieter J. van Zee '95

Carollee Woodstock '81

Thank you!

Every attempt has been made to ensure the accuracy of these lists. However, if you notice an error, please contact:

Pam Powell, Associate Director of Stewardship, OSU Foundation, Pam.Powell@osufoundation.org or 541-737-5820.



Omar
Rachdi

Student Doctor of the Year

Omar Rachdi (B.S. '14) was awarded the 2020 Student Doctor of the Year from Western University's College of Osteopathic Medicine of the Pacific Northwest. Finishing his final year of medical school, Rachdi is known for his dedication to his community and the health of those around the world. As a Moroccan-American dual citizen, Rachdi is an advocate for underrepresented minorities to experience equitable and representative healthcare. An editorial columnist with the Lebanon Express, he has written on subjects ranging from the COVID-19 crisis to racial disparity in healthcare. Rachdi is grateful for support from his parents and his wife Taylor Bundy (B.S. '14), who also received her D.O. in 2021.



Zack
Bango

From Botswana to LA

Zack Bango (B.S. '18) joined the Peace Corps in Botswana after graduating with a passion to work in the 'diseases of poverty' field. Shortly after, he

transitioned to a malaria research lab where he could better apply his undergraduate laboratory experience. There, he studied an emerging form of malaria in Africa, *Plasmodium vivax*. The pandemic forced him to evacuate Botswana, but not before helping set up a COVID-19 testing platform for the government to use.

In the U.S., Bango worked at a COVID-19 testing site in Los Angeles, where he helped develop a startup company and ran a diagnostics laboratory processing approximately 2,000 point-of-care COVID tests a day. He will start medical school in the fall at the David Geffen School of Medicine at UCLA, where he plans to concentrate on global health with hopes to return to international work.



Andres
Cardenas

An outstanding environmental epidemiologist

Andres Cardenas (B.S. '10, M.P.H. '12, Ph.D. '15), assistant professor of environmental health sciences at the UC Berkeley School of Public Health, was awarded the Outstanding New Environmental Scientist grant from the National Institute of Environmental Health Sciences. He is currently investigating the prenatal influence of exposure to multiple metals, air pollution, endocrine disrupting compounds, diet and maternal medication use on the epigenome of newborns and children.



CONGRATULATIONS

Top row: Bali, Browne, Frey, Grutzius
Bottom row: Hauser, Josephson and Kumar

Despite lives interrupted by the pandemic, 58 students graduated with their bachelor's degrees in 2020 – 51 biochemistry and molecular biology majors and seven biochemistry and biophysics majors. We want to honor their hard work, perseverance and accomplishments here with a hearty *Congratulations!*

Here are just some of our talented and resilient graduates.

Shanelle Almeida enjoyed meeting and learning with other students who shared the same passion for science as her. As she prepares for medical school in the future, she credits **Kari van Zee** for helping to “shape my path for the future.”

The pandemic gave **Meghan Bali** more time to think about her plans for the future. She hopes to attend graduate school, studying “something related to healthcare.” She appreciated the sense of community within the BMB major: “Doing all of this alone would have been very difficult, so that community support really did it for me.”

OSU volleyball player **Makenna Browne** moved to North Carolina after graduating for an internship where she will continue her research endeavors. At OSU, she worked with Daniel Rockey (Carlson School of Veterinary Medicine), analyzing the genome of *Chlamydia trachomatis*. She plans to apply to Ph.D. programs soon.

For **Brooke Frey**, “the biochemistry and biophysics department is like a family to me.” After graduation, she spent the year working as a medical assistant at a pain management clinic while preparing her medical school application.

Sonia Grutzius used genetic code expansion sources for her Honors thesis, which focused on the development and characterization of nanobody sensors to detect intracellular nitration.

Benjamin Hauser transferred into the department halfway through his junior year, so he played a lot of catch up to graduate. After graduating, he began a fellowship at the National Institutes of Health in Maryland.

He plans to pursue a M.D./Ph.D. and eventually become a neonatologist.

Rachel Josephson hopes to pursue a master's in public administration or public policy. She hopes to work “in a field where I can do policy, legal or advocacy work” in the future.

Tanushri Kumar enjoyed the research opportunities available in the department. She worked with **Colin Johnson** since her first year, where she studied a family of proteins called ferlins. Kumar is now attending graduate school at the University of Washington for her Ph.D. in biophysics, and hopes to be a cancer research scientist.

Carolyn Lazaroff spent the last year applying to Ph.D. programs and working in a research laboratory. As an undergraduate, she worked in the **Freitag** Lab, an experience she greatly missed after the shutdown.

Ryan Lopez started his master's in toxicology at OSU in fall 2020. He hopes to work long term in a toxicology lab in the future.

Cristal McAninch loved all the hands-on learning in the department. “These labs taught me a great deal about what research would be like and opened me up to the possibility of it being a career.” She hopes to attend graduate school to pursue a master’s in genetic counseling.

Gymnast **Alyssa Minyard** has been working as a medical scribe and working towards her medical assistant certification since graduating. She plans to apply for medical school soon.

Katlyne Moore hopes to work in a medical laboratory as a medical scientist one day “because I feel a pull to help people in the way I can.” She is currently working as an analytical chemist.

Danielle Myers hopes to one day work in a forensic science lab. She enjoyed that the biochemistry and molecular biology major “gave me so much exposure to different fields of science.”

Alexandra Phillips’s favorite professor was **Viviana Perez**. “Even though I barely passed her class, I could tell she cared about her students who showed up to office hours and genuinely tried to learn all the tiny/ crazy details about metabolism.” She is currently pursuing a master’s degree in OSU’s microbiology department, working with Maude David.

Tori Puoci’s passion is making “science accessible to nonspecialized audiences.” For his Honors thesis, he created a podcast, At This Point, focused on exploring undergraduate student research topics in ways anyone can understand.

Diego Rodriguez credits **Afua Nyarko’s** guidance in allowing him to realize his dreams. He is completing a two-year research associate position with the director of the Broad Institute of MIT and Harvard. He plans to pursue an M.D./Ph.D., hoping to become a surgeon.

Joaquin Rodriguez is pursuing a Ph.D. in microbiology and immunology at New York University. Rodriguez, formerly a world-class surfer, transferred to OSU his junior year and joined **Elisar Barbar’s** lab. Last summer, he continued his COVID-19 research to determine what role the N-protein in SARS-CoV-2 plays in the replication and transmission of the virus. His work has contributed to several papers.

Valerie Ramirez enjoyed meeting people in the department “who are passionate about biochemistry, which made it even more fun to explore.” She is currently attending a master’s program in clinical lab sciences to become a medical laboratory scientist.

Maike Winziers is currently pursuing her master’s degree in molecular life sciences at the Universität zu Lübeck in Germany. “I have genuinely enjoyed every single professor I have encountered in the biochemistry department.”

Top row: Lazaroff, McAninch, Moore, Phillips
Bottom Row: Puoci, D. Rodriguez, Ramirez

CLASS OF 2020



From the labs

Elisar Barbar (left) and graduate students Heather Masson-Forsythe (foreground) and Kayla Jara (right)



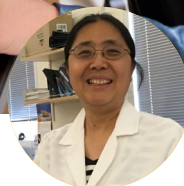
Heather Masson-Forsythe



Seth Pinckney



Joaquin Rodriguez



Zhen Yu



David Hendrix



Rick Cooley

Exploring new ways to thwart the COVID-19 virus

The Barbar Lab took a key step toward new drugs and vaccines for combating COVID-19 with a deep dive into the virus' nucleocapsid protein, or N protein. The N protein is a prime target for disease-fighting interventions because of the critical jobs it performs for the novel coronavirus' infection cycle and because it mutates at a comparatively slow pace. Drugs and vaccines built around the work of the N protein carry the potential to be highly effective and for longer periods of time – i.e., less susceptible to resistance.

Biophysical studies of N with large segments of RNA by nuclear magnetic resonance are rare, explained Barbar, because of the difficulty of preparing the partially disordered N protein and long RNA segments – both prone to

aggregation and degradation – but these kinds of studies are a specialty of the Barbar Lab. Other researchers' studies generally have been limited to much smaller pieces of RNA and smaller pieces of the N protein.

Drugs that thwart the N protein's flexibility would thus be one potential avenue for pharmaceutical researchers, said Barbar. Another possibility would be drugs that disrupt any of those protein/RNA complexes that prove to be of special significance.

Barbar and biochemistry Ph.D. candidate **Heather Masson-Forsythe** led the study with help from undergraduate students **Seth Pinckney** and **Joaquin Rodriguez**, and faculty research assistant **Zhen Yu**. **David Hendrix** and **Rick Cooley** also collaborated on the project.

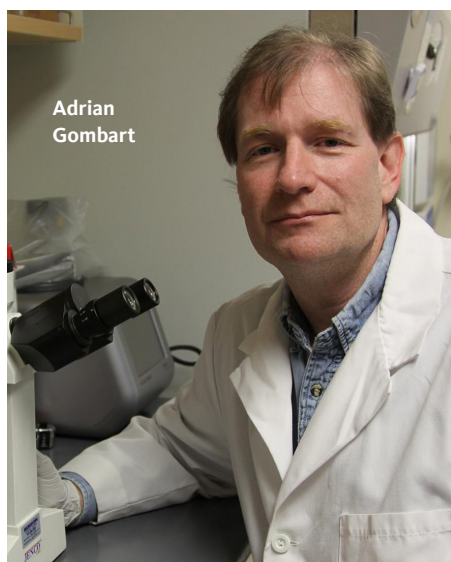
Their findings were published in *Biophysical Journal*, and are an important jump-off point for additional studies of the N protein and its interactions with RNA as part of a thorough look at the mechanisms of SARS-CoV-2 infection, transmission and control.

New science, same message: Take your vitamins.

Adrian Gombart led a widely publicized study in the journal *Nutrients* linking vitamin and mineral supplementation with shorter and less severe illnesses. The study measured bloodstream levels of zinc and vitamins C and D – micronutrients that are widely agreed to be important for proper immune function – in 42 healthy people aged 55-75 and found that participants taking the supplement showed

improved vitamin C and zinc levels in the blood vs those taking a placebo vitamin, and reported less severe symptoms of illness.

Gombart's research also suggests that topical applications of vitamin D may benefit human health. Vitamin D treatment can dramatically reduce the number of disease-causing bacteria in skin wounds. Gombart hopes this research can lead to more effective treatments of *Staphylococcus aureus*, a human pathogen that causes skin infections. They published their findings in the *Journal of Steroid Biochemistry and Molecular Biology*.



Adrian
Gombart

Devan, a Belgium-based developer of specialty chemicals for textiles, launched a new blend of its R-Vital range of microencapsulated antioxidants and vitamins that are absorbed into the body through the fabric. Inspired by Gombart's findings, the new 'multivitamin' blend consists of vitamin C, vitamin E and ginger and is developed for immunity-boosting properties.

Gombart also coauthored and published two reviews on the importance of micronutrients and nutrition on immune function

that were cited nearly 800 times during the pandemic. Various news radio and TV stations around the country interviewed him about research linking vitamin D deficiency to increased risk for mortality due to COVID-19.



Tory
Hagen

A new weight loss solution: Lipoic acid

Tory Hagen, along with collaborators from the Linus Pauling Institute and OHSU, discovered that lipoic acid is an effective supplement for weight loss in overweight but otherwise healthy people. Researchers administered lipoic acid to 31 participants over a period of 24 weeks. The results showed decreases in body weight, body fat and some markers of inflammation within the participants who received lipoic acid.

Lipoic acid occurs in both plants and animals on a cellular level, where it is involved in amino acid metabolism, antioxidant defenses and anti-inflammatory responses. However, lipoic acid supplements can be quite expensive, so more research is needed to determine how to maximize benefits with smaller amounts of the supplement. The findings were published in the *Journal of Nutrition*.



Barbar



Freitag



Hsu



Johnson

Funded grants

Elisar Barbar received a two-year \$300,000 grant from the NSF EAGER (Early-Concept Grants for Exploratory Research) program to pursue research on how the SARS-CoV-2 nucleocapsid protein performs its essential functions in viral infection and transmission.

Michael Freitag received \$125K from the US-Israel Binational Science Foundation (BSF) for his project on "Influence of chromatin state and mismatch repair efficiency on genetic diversity" with Shay Covo (Hebrew University).

Victor Hsu is a collaborator on a newly funded NIH R01 grant led by Chemistry Professor Christopher Beaudry (lead PI) for \$981K over four years to work on "Cascade Reactions for Biologically Active Natural Products."

Colin Johnson received \$494K in funding over three years from NSF to establish a common function for ferlin proteins in membrane fusion using novel genetic code expansion and single molecule techniques.



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BEAVERS CARE

Join with us to support College of Science students.

Every day, more and more students need financial support. Up to a third of OSU students have suffered financially due to the COVID-19 pandemic.

Your gift to the **Beavers Care – College of Science Fund** will help our students weather the unexpected financial burdens they face and empower them to succeed as students and future science leaders.

Your support of any amount can make all the difference during this uncertain time.



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