Oregon State University
College of Science

Department of Biochemistry and Biophysics

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Corvallis, OR 97331

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COLLEGE OF SCIENCE DEPARTMENT OF BIOCHEMISTRY AND BIOPHYSICS

SUMMER 2022

CATALYST

Oregon State University

CATALYST

Summer 2022

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On the cover — David Hendrix took a photo of what he calls "BeaverHenge." During this event, the sunset is visible in the skybridge connecting the ALS Building and Cordley Hall. It can be seen around the spring and fall equinox, which coincides with the beginning of spring and fall terms.

From the Head

Elisar Barbar

Greetings, faculty, students, alumni, and friends.

One year ago, I sent out a greeting to you all forecasting that we would soon be entering a post-COVID era. While that hope may not have materialized quite as we imagined it, our students and faculty have continued growing and adapting in the face of every obstacle. I am so excited to see that the campus is buzzing again with signs that life is starting to return to normal.

Despite the roller coaster of COVID, the state of the department is very strong. We have had an exceptional year at every front. We have been *productive*, *persistent*, *pioneering*, *proactive*, *progressive*, and, in short, *phenomenal!*

I am proud of the BB faculty, staff and graduate TAs and mentors for their tireless work in nurturing the BB and BMB family! Our students continue to lead the university (and I like to think the nation) in receiving nationally competitive scholarships: **Gretchen Fujimura** was one of only two OSU students who received the Barry Goldwater award. Several students received Fulbright fellowships, internships abroad, presented at national and international conferences, co-authored peer-reviewed publications on research on SARS-CoV2, cancer biochemistry, deafness, and mechanisms of aging and disease.

On the faculty front, **Michael Freitag** received the University Distinguished Professor award –the highest honor bestowed to a professor at OSU. We successfully recruited four new faculty to start in fall 2022 and are already excited about how the department will look next year. This has been our busiest graduate student recruiting season yet. We also have several new postdocs, a large number of them hired by the new GCE4All center which kicked off winter term. As the first NIH-funded GCE center in the world, we are all energized about the huge impact it will have on our department and our research infrastructure.

Many BB faculty and students participated in conferences hosted by the Biophysical, Fungal Genetics, ASBMB, Chemical Biology & Physiology and Protein Societies. Closer to home, our first Biophysics Day event was organized by our BPS student chapter – a wonderful recurring event to connect biophysicists with cell biologists in Oregon.

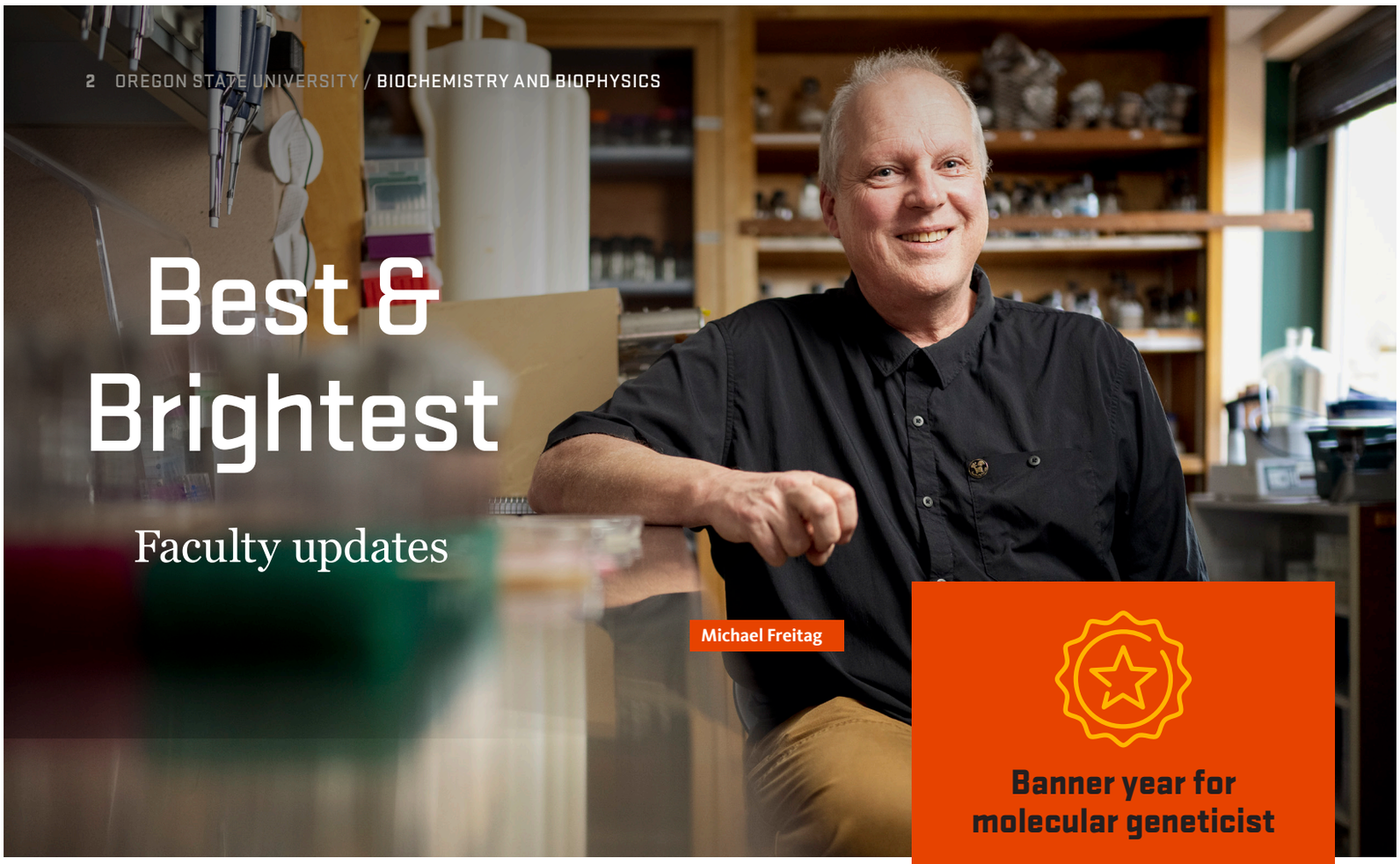
Lastly, I would like to congratulate our graduating classes of 2021 and 2022 and recognize their exceptional resilience and motivation these past few years. I am proud to be the head of a department whose graduates not only achieve their career goals in medicine, graduate school, or biotech research – but are also powerful advocates for the importance of basic science in shaping a healthier world.

I look forward to continuing our productive trend this year working together, taking risks, insisting, and persisting in revealing how life works for the benefit of all.

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



Michael Freitag

David Hendrix

Awarding a deep learning pioneer

David Hendrix received the Dean's Early Career Award, which recognizes exceptional achievement in research and education of faculty no more than four years beyond the tenure date. His research at OSU has focused on applying deep learning approaches to RNA biology, working with collaborators to bring his computational expertise to address biological research questions. Among other innovations, Hendrix has pioneered the use of deep learning in cancer detection based on gene expression data, an approach now gaining in popularity.

"In Dave's hands, the full complexity of biological information emerges. As evident from his success, he is solving fundamental problems that have practical real-world impacts on diverse issues," said microbiology Professor Steve Giovannoni.

Since arriving at OSU in 2013, Hendrix has published 24 papers and brought in over $5.9M in funding from the NSF, NIH and USDA. In 2019, he received OSU's University Mentoring and Professional Development Award. On the education side, Dave has created student-centered resources including an open-access bioinformatics textbook. He also helped develop the graduate biological data science minor.

Banner year for molecular geneticist

This has been a big year for **Michael Freitag**. He was named one of three new 2022 University Distinguished Professors – the highest honor the university can bestow on a faculty member – and gave this year's F.A. Gilfillan Memorial Lecture in May 2022. Freitag was the 2021 recipient of the F.A. Gilfillan Award, which recognizes a career of scientific achievements in the College of Science. His long-time research focus is in the area of epigenetics – how DNA and protein modifications regulate the packaging, copying and expression of DNA. Freitag, an AAAS fellow, is at the center of fungal epigenetics and chromosome structure research and has far-reaching influence in the field. His colleagues describe him as "among the most respected scientists in the field of fungal biology" and a world-wide leader and innovator. His lab is a magnet for researchers from around the world.

Keeping the department running

Tony Reyna, business manager for the BB department, was one of the recipients of this year's Gladys Valley Award, which recognizes outstanding job performance and dedication by a staff person to their department and to the College of Science. Joining the biochemistry department over five years ago, Reyna is particularly appreciated for his willingness to go above and beyond the scope of his job responsibilities to ensure the office runs smoothly despite numerous trying circumstances. "I cannot think of anyone else who worked harder and delivered better than Tony did, and of no one else who is more deserving," said Elisar Barbar.

All in the [ferlin] family

Colin Johnson received a 2022 College of Science Science Research and Innovation Seed Individual Investigator, or SciRIS-ii, award for a project to uncover new connections between the ferlin family of genes and disease. In the first study of its kind, Johnson will focus on ferlin gene Fer1L6, which has been linked to ovarian failure and neural tube development deficiencies. Johnson's previous research has uncovered key components of otoferlin gene therapy, moving one step closer to restoring hearing for the congenitally deaf.

Curtailing the development of Alzheimer's

As part of the SciRIS program, the College of Science offers other donor-funded awards to bolster research and innovation. The Disease Mechanism and Prevention Fund (DMPF) supports research into the mechanism, diagnosis, treatment and prevention of human disease by College of Science faculty. These funds are provided by a generous gift from David and Donna Gould. **Adrian Gombart** was one of this year's DMPF awardees. Gombart's DMPF project, "The role of the cathelicidin antimicrobial peptide in the development of Alzheimer's disease," continues work from a previous DMPF award, studying the potential use of an antimicrobial peptide called cathelicidin to curtail the development of Alzheimer's. Vitamin D and other nutrients regulate expression of the peptide. Gombart's project could lead to further development of effective preventative therapies or treatments of Alzheimer's disease.

Building a love of biochemistry through new teaching approaches

Associate Professor **Phil McFadden** received the 2022 Blended Learning Innovations in Pedagogy (BLIP) initiative award of $7K to help redesign BB450, General Biochemistry. The BLIP program was launched jointly through OSU's Center for Teaching and Learning, Academic Technologies, Ecampus and the Office of Academic Affairs with the goal of improving learner success in large enrollment courses. BB450 is a large introductory course that mixes online and in-person instruction. McFadden is working to align traditional classroom lectures, online engagement, and assessment and teaching innovations developed during the COVID-19 pandemic to address online student learning needs.

"The aim is to engage students more deeply and actively while getting the word out about the beauty and excitement of biochemistry," said McFadden.

Well-deserved promotions

Three faculty members received promotions during the 2021-22 academic year: **Kari van Zee** was promoted to senior instructor II. **Afua Nyarko** was promoted to associate professor with tenure. **Lauren Dalton** was promoted to senior instructor I.


Kari van Zee


Afua Nyarko


Lauren Dalton

On the Move

Students making a difference

Gretchen Fujimura


Grace Scuderi


Sahana Shah

Future physician-scientist

Honors BMB student **Gretchen Fujimura** was one of two OSU students awarded a 2022 Barry Goldwater Scholarship, the nation's most prestigious research award for undergraduates in STEM. With her scholarship, she traveled to Tokyo, Japan, for an internship with Amgen. Gretchen aspires to an M.D./Ph.D. in immunology, with the goal of becoming a lead researcher on investigational vaccine trials.

The ultimate hands-on experience

BMB and Environmental Studies double major **Giulia Wood** spent six months at Antarctica's Palmer Station researching krill as part of a team led by Kim Bernard, associate professor in the College of Earth, Oceanic and Atmospheric Sciences. "One of the things I really enjoy about being a BMB major is the amount of time that the professors put in to get us hands-on lab opportunities."

Honors BMB major **Daniel Bacher** traveled to Ithaca, NY for a summer internship at the Boyce Thompson Institute on Cornell's campus. **Sarina Grant**, a BB and Finance double major, was awarded a summer investment banking internship with JP Morgan in Los Angeles, CA.

SURE making a difference

During her 2021 SURE experience, BMB major **Grace Scuderi** worked with faculty mentor Tory Hagen examining cellular structures involved in the onset of Alzheimer's disease. "This project inspires me to better the lives of others through research."

Amgen Scholar

Sahana Shah headed to UCLA in the summer of 2022 to conduct research in the Loo Lab for Mass Spectrometry as an Amgen scholar, where she worked on the structural characterization of proteins and proteomics.

Volunteerism a way of life

Grace Petrina, a third-year Honors student, volunteers with the Polk Community Free Clinic and the South Corvallis Food Bank. Her resume also includes Room at the Inn, IMPACT for Life and an HPV vaccination campaign. "I want to pursue a career in the field of community health, either in health law or as a public health official, focusing on sexual and reproductive health," she said.

2022 CURE and SURE

Twenty-three BB/BMB students received Cripps Undergraduate Research Experience (CURE) and Summer Undergraduate Research Experience (SURE) scholarships, which provide 11 weeks of paid summer research with a faculty mentor.

CURE Scholars

Lizzy Milford (Michael Freitag)
Devin Wright (Michael Freitag)
Coban Brooks (Elisar Barbar)
Dylan Lefor (Elisar Barbar)

SURE Scholars

Ramzy Al-Mulla (Heidi Kloefkorn)
Rebecca Bingham (Maria Franco)
Evan DuVivier (Adrian Gombart)
Mathew Frischman (Kathy Magnusson)
Jenna Gaston (Kenton Hokanson)
Minh Triet Ho (Dee Denver)
Kaitlyn Kim (Kathy Magnusson)
Finn Lawless (Martin Schuster)
Auria Lee (Taifo Mahmud)
Ebunoluwa Morakinyo (Gitali Indra)
Annalee Pelayo-Ortega (Michael Freitag)
Lydia Pung (Afua Nyarko)
Abigail Pung (Ryan Mehl)
Rachel Pung (David Dallas)
Rebekka Purcell (Patrick Chappell)
Jake Roetcisoender (Daniel Rockey)
Alexis Schwartz (Kenton Hokanson)
Kavi Vaidya (Claudia Maier)
Mitchel Wambui (Lia Danelishvili)

Meet our new graduate students!

Hannah Stuwe (Advisor: Barbar) graduated from OSU in 2019 with her bachelor's degree in BMB. Her research interests involve viral protein-protein and protein-RNA interactions and NMR spectroscopy. She is also the recipient of the 2021-22 ARCS Foundation Oregon scholarship.

Coming from Pine City, MN, **Melinda Rydberg** (Advisor: Franco) previously studied biochemistry at the College of St. Scholastica in Duluth, MN. She is studying tyrosine nitration and its effects in breast cancer cells.

Moriah (Longhurst) Mathis (Advisor: Cooley), who received the 2021-2022 Provost's Distinguished Fellowship, grew up near Spokane, WA and studied chemistry at Brigham Young University. While there, she worked in a research lab and fell in love with protein crystallography.

Reginald Appiah-Kubi (Advisor: Hendrix) hails from Ghana, where he obtained his bachelor's degree in biochemistry from the University of Cape Coast. His research interests involve genomics and bioinformatics. He is studying hop genomics and general principles governing genetic crossover and recombination.

Sarah McGee (Advisor: Mehl) graduated from Chico State in 2021 with a bachelor's degree in biochemistry. In the Mehl Lab, she is using genetic code expansion to study the structure and function of a potential denitrase enzyme.

Newly minted

A member of the Molecular and Cellular Biology program, **Riley Bednar** completed his Ph.D. under advisor Ryan Mehl in June 2021. He is currently a postdoctoral researcher in the Mehl Lab, applying genetic code expansion technologies to answer important biological questions.

Heather Masson-Forsythe and **Aayushi Manchanda** earned their Ph.D.s in October 2021. Masson-Forsythe, a former member of the Barbar Lab, is now an NSF AAAS Science & Technology Policy Fellow in Washington, DC, where she communicates science to the White House, Congress and the public. Manchanda worked under advisor Colin Johnson and is currently a scientist at Decibel Therapeutics in Boston, MA.

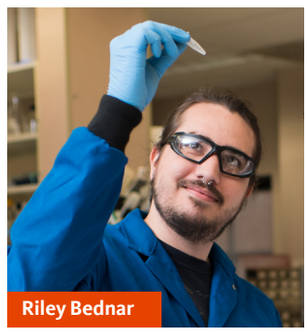
Under advisors Afua Nyarko and Ryan Mehl, respectively, **Kasie Baker** and **Elise Van Fossen** earned their Ph.D.s in December 2021. Baker is currently a Field Applications Scientist at Malvern Panalytical, Westborough, MA. Van Fossen is currently a postdoctoral researcher at Pacific Northwest National Laboratory in Richland, WA.

Shauna Otto successfully defended her thesis in March 2022 with faculty advisor Colin Johnson. She is currently a postdoctoral researcher at the University of Washington.

Kayla Jara earned her Ph.D. in May 2022 with faculty advisor Elisar Barbar. In 2021-22, she was an OMSI Science Communication Fellow. She is currently working with Ryan Mehl in the new GCE4All Center (see page 11).

In June 2022, **Rosalyn M. Fey** earned her Ph.D. in the Hendrix Lab where she studied light-activated gene expression and circadian rhythms during aging using model organism *Drosophila melanogaster*.

New grad students Sarah, Moriah, Melinda, Reginald and Hannah

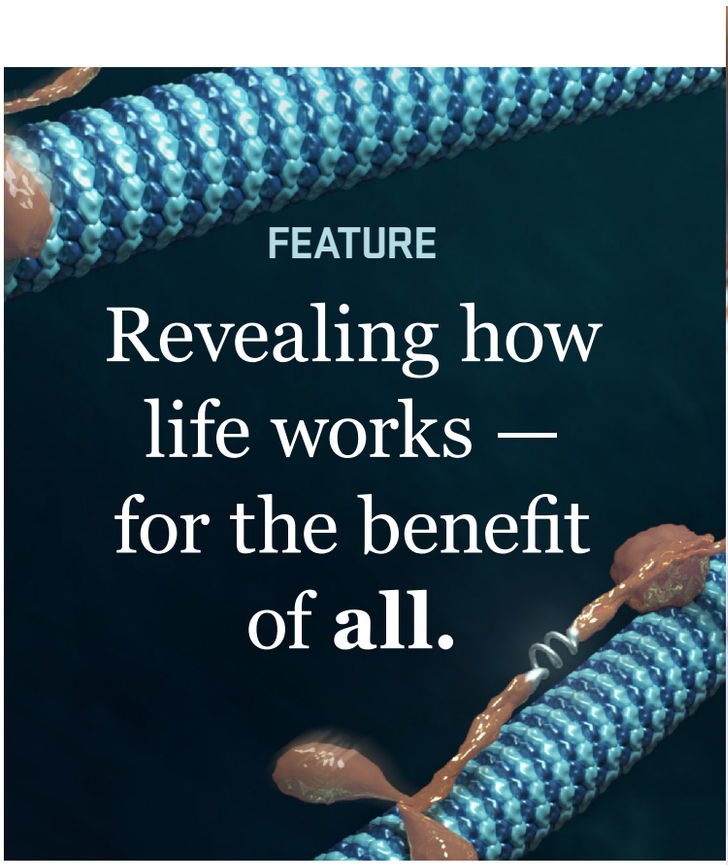


Riley Bednar

Kayla Jara at OMSI

Elise Van Fossen

Aayushi Manchanda



FEATURE

Revealing how life works — for the benefit of **all.**

Weihong Qiu's lab (right) studies Kinesin-14s (left), microtubule-based motor proteins that play important roles in cell functions.

The heart of our mission is "revealing how life works for the benefit of all." Our faculty conduct research on basic and translational science, investigating the molecular determinants of disease such as protein interactions, chromosome stability, the movement of organelles and repair on the cellular level. Their findings deepen our scientific understanding of conditions like cancer, hearing impairment and immune dysfunction. Here are just some of the ways our faculty's work is leading to health breakthroughs.

Michael Freitag's lab demonstrates how methylation of histone proteins helps the genome adapt to a changing environment. Their model organisms are fungi, which reflect the conditions observed in more complex organisms. "Fungi lend themselves well to laboratory teaching. They provide us with an excellent and cost-effective, but still underutilized, resource for new materials and pharmaceuticals research," he said.

The Freitag Lab investigates the assembly and maintenance of facultative heterochromatin, regions of chromosomes where the genes are normally silent, but where changing conditions can actually turn some of those genes on. Through this work, we can understand genome stability that is essential for regulated cell division and avoidance of deleterious mutations.

Another set of regulators for cell division are kinesins, microtubule-based motor proteins that harness the chemical energy from ATP to generate forces and directional movements in eukaryotic organisms. Kinesin motors play a wide range of essential cellular functions such as chromosome segregation, spindle formation and elongation and transport of organelles. Research in **Weihong Qiu**'s lab showed that KlpA is a bidirectional kinesin-14 motor, and a regulator called TinA binds to KlpA to reverse its directionality. Building upon these exciting findings, researchers in the Qiu Lab are working to dissect the mechanism by which TinA reverses KlpA directionality and affects its force production on the microtubule. With this information, they can develop novel methods for engineering artificial motor proteins with desired directionality and speed.

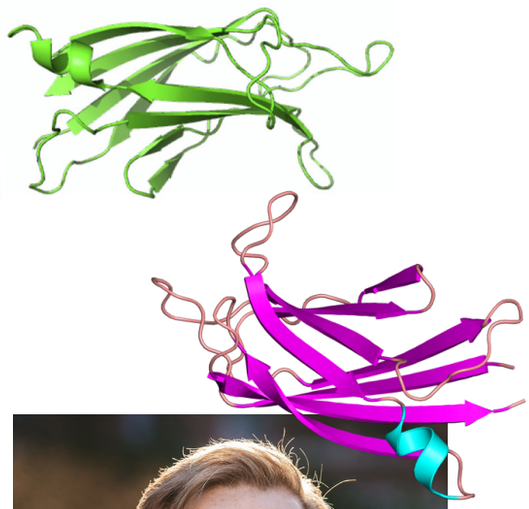
Afua Nyarko's lab also investigates how proteins work together in cellular architecture. They dissect the mechanisms of multi-protein assemblies in signaling pathways of cells, with the goal of identifying novel

strategies to selectively modulate downstream responses. Their primary focus is the Hippo signaling pathway, which regulates cell growth and division. Graduate students **Kasie Baker** and **Amber Vogel** demonstrated for the first time that protein complexes in Hippo signaling are not single molecular species, but an ensemble of interconverting complexes. The Hippo signaling pathway is an attractive target for cancer drugs, as well as a key to somatic growth and development.

Colin Johnson's lab is also interested in cellular signaling, specifically in how sensory hair cells of the inner ear release neurotransmitters during the encoding of sound. The protein otoferlin coordinates release of the neurotransmitter from the hair cell in sync with the frequency of the sound wave. Mutations in the otoferlin gene are responsible for a form of deafness known as DFNB9, where neurotransmitter release from the cell is lost. "That was surprising since otoferlin was known to help encode hearing information but had not been thought to be involved in sensory cell development," Johnson said.

Another Ferlin family protein, dysferlin, is critical for the repair of lesions in the skeletal membrane. Mutations in the dysferlin gene can lead to several types of muscular dystrophy. The Johnson lab recently found that dysferlin binds a specific lipid found exclusively at the cell membrane of muscle cells, and that this binding event appears to direct dysferlin to injured areas for subsequent repair. These findings could lay the foundation for treating deafness and muscular dystrophy.

Repair of injury is also a focus of **Adrian Gombart**'s lab. They investigate using the antimicrobial peptide cathelicidin to kill pathogens and promote wound healing. Together with Drs. Arup Indra and Gitali Indra in the College of Pharmacy, they experimentally inhibited the growth of bacteria in skin wounds of mice by using vitamin D to induce cathelicidin expression. Working with a team led by Jingwei Xie, a nanomaterial scientist at the University of Nebraska Medical Center, the Gombart Lab is developing nanofibers that release the active form of vitamin D to boost production of cathelicidin and additional immune-related proteins. Together, they hope to develop nanofiber wound dressings which doctors can use to minimize infections and speed wound healing in surgical patients, saving billions of dollars in health care costs.



Top: Otoferlin and dysferlin are proteins of great interest to the Colin Johnson lab. **Above:** Adrian Gombart's research is focused on injury repair. **Left:** The Nyarko Lab, including Afua Nyarko (center), and grad students Kasie Baker and Amber Vogel (right), study Hippo signaling.

Congratulations Recent Grads!

The department has graduated two classes of students in 2021 and 2022. Our 2021 class included 71 biochemistry and molecular biology (BMB) majors and 10 biochemistry and biophysics (BB) majors. In 2022, we graduated 72 BMB majors and 14 BB majors. Congratulations to these extraordinary future scientists. Here are just some of their voices.

Class of 2021

A 'FEARLESS' SCIENTIST

BMB major **Ilana Gottfried-Lee** spent her last two years at OSU performing cutting-edge research under the guidance of Ryan Mehl and Rick Cooley in the Unnatural Protein Facility. Her work was published in the Journal of Molecular Biology, and she presented her findings at the OHSU Chemical Biology and Physiology Conference. "Ilana is fearless," said Cooley. "She refuses to accept failure and will become an important role model for all women in science."

RESEARCH LAID 'EXCEPTIONAL FOUNDATION'

After more than three years doing research as an undergraduate in the

Barbar Lab, Honors BB graduate **Seth Harris Pinckney** co-authored two manuscripts, one of which was published in a prestigious scientific journal. "Working as a part of the Barbar team has provided me with an exceptional research and work foundation. I will miss Professor Barbar and the friendships I've made at OSU." Pinckney hopes to enter medical school in the fall of 2023.

Class of 2022

Anneka Ahumada decided to major in BB because she was left hungry for more after taking chemistry in high school. "What I didn't know was that I signed up for a major that would introduce me to lifelong friends and colleagues."

Honors BMB major **Josh Brenne** credits his faculty mentors for helping him reach his potential. He plans on gaining some life experience before applying to medical school.

OSU volleyball player and Honors BMB major **Nya Buckner's** favorite faculty member was Kari van Zee "because she brings so much positive energy to the classroom and brings the best out of her students."

BMB major **Mikayla Chen's** favorite memory was studying abroad in Spain during the fall 2021 term. She is now attending Johns Hopkins University for her Ph.D. in biochemistry, cellular and molecular biology.

Robert Cornwell-Arquitt, Honors BMB major, said that BOT460, Functional Genomics, "inspired me and excited me about the future of molecular biology." He is now a master's student in the BB department at OSU.

BMB major **Chrysilla Emanuelle's** favorite memory was working as a peer advisor for the College of Science and interacting with prospective students during tours. She is now starting her Ph.D. in cellular and molecular pharmacology at the University of Rochester.

BB major **Kailie Franco** can't pick just one favorite faculty mentor. "Kari van Zee helped me reach new heights. Andy Karplus instilled a love for the basics of science, and Ryan Mehl got me into research I truly love."

Ashlynn Gallagher, BB major, interned at Zoetis in Fort Collins, CO after graduating and is now in a two-year post-bacc fellowship at the National Institutes of Health in Washington, DC.

2021 Goldwater scholar and BB major **Emily Gemmill** loved how interdisciplinary her program was. Her favorite class was Biophysics II with Afua Nyarko. "I learned a lot about different biophysics techniques that will be helpful as I start grad school." She is now in a Ph.D. program at the University of California Santa Barbara.

BB major **Casey Huggins's** favorite memory was sitting down for his first class at OSU. He appreciated that "all of life's processes can be described by chemistry and physics." He plans to attend medical school in the future.

Natalie Johnson, Honors BMB major, loved how close-knit her major was. "I felt like I got to know my peers and advisors really well." She is now completing a two-year post-bacc fellowship at the National Institutes of Health in Washington, DC before applying to M.D/Ph.D. programs.

BMB major **John Lam** most enjoyed meeting other people passionate about science. He especially liked his BB315 Molecular Biology Lab class: "We got to get hands-on with the science we were learning!"

During remote learning, BMB major **Rowan Nelson** found a community through the people she met in the Biochemistry Club, whose logo she designed. She is now completing an NIH-funded one year post-bacc fellowship at the University of Washington before applying to graduate schools.

The BMB major was "the right amount of challenging and fun" for **Emma Pearce**. She hopes to study astrobiology in the future.

Kellie Roth most enjoyed "the tight-knit BB/BMB community" and "growing and learning alongside my best friends." She is now pursuing her master's in pharmaceutical sciences at OHSU.

BMB major **Alex Sathler's** favorite faculty mentor was Maria Franco. "She is an amazing scientist that invests heavily in her students." He is now working at the National Institutes of Health in Washington, DC, and hopes to attend graduate school in bioengineering in the future.

Honors BB major **Natalie White** loved how the senior biochemistry lab courses were self-directed. "We had the chance to work in groups to develop hypotheses and use scientific methods that we had been learning about throughout college!" She plans to apply to M.D./Ph.D. programs in the future.

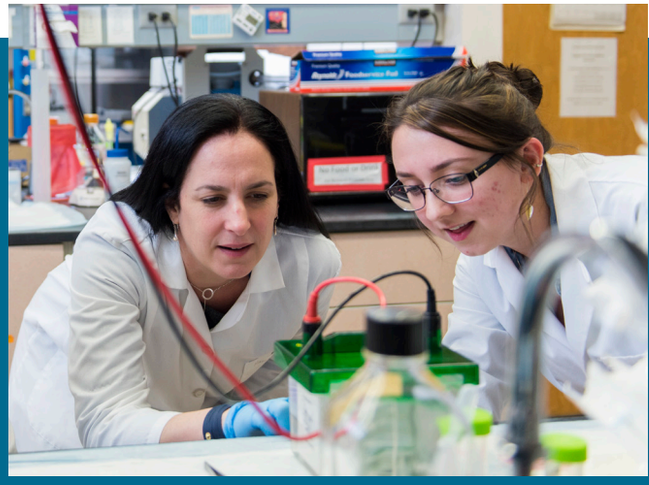
Russian native and BB major **Elizaveta Zhivaya's** undergraduate research in microbiologist Maude David's lab set her up well for her future. She is now starting a Ph.D. in neuroscience at Washington State University.

Unraveling the essence of Cannabaceae

David Hendrix received a three-year $638K award from the U.S. Department of Agriculture National Institute of Food and Agriculture to create a database that further explores the distinct adaptations responsible for the variability in aromas, flavors and production of Cannabaceae. In 2021, Hendrix and collaborators became the first to successfully sequence the hop genome with "long read" sequence technology. Unusually large – similar in size to the human genome – and complex to work with, this research revealed similarities between hemp and hop gene structures.

Now, in collaboration with OSU faculty from horticulture, pharmacy and the USDA, Hendrix hopes this project will take several steps forward in better understanding the genomic differences that lend certain hops and hemp varieties their distinctive characteristics. Currently, developing new strains of hops and hemp is an expensive and time-consuming process. This study could help eliminate many of those obstacles. "We will help breeders develop new varieties of hop and hemp that will meet the needs of emerging markets with an increasingly sophisticated palette for exotic flavors and aromas," said Hendrix.

From the labs



Slowing neurodegenerative diseases

Maria Franco and her research team discovered a new class of potential drug targets for people suffering from neurodegenerative conditions such as Alzheimer's, Parkinson's and Lou Gehrig's diseases. Estimates suggest that more than 6 million Americans suffer from Alzheimer's, and another 1 million have Parkinson's.

With medical conditions involving inflammation, including neurodegenerative disorders, diseased cells produce peroxynitrite – the most powerful oxidant a cell can make. "We had earlier found that oxidation of specific molecules by peroxynitrite leads to the death of motor neurons, the cells that carry signals from the brain to the muscles to coordinate muscle movement," Franco said. "Now we know that the oxidation of different parts of Hsp90 can elicit different toxic functions in the protein."

By understanding the ways that oxidation modifies the Hsp90 structure, and how the oxidized protein works in the cells, researchers can now look for drugs that bind to the modified structure of Hsp90 and stop its toxic function without affecting the activity of normal Hsp90 in healthy tissues. "That means such drugs should have minimal to no side effects," said Franco. The findings were published in Redox Biology in February 2022.

New investigative technologies

Capitalizing on Oregon State's high concentration of expertise and resources for studying dynamic protein complexes across scales, **Elisar Barbar**, **Afua Nyarko** and **Maria Franco** teamed up with Michael Blouin from integrative biology to establish new technologies to investigate cancer-related complexes and host-parasite interactions. The team hopes this initial exploratory work can lead to an eventual grant from the NSF Biology Integration Institute, which supports interdisciplinary projects that translate discoveries from the molecular scale to the cellular level of organisms and vice versa.

A different kind of electrician

As Director of the Electrophysiology Core Facility, **Kenton Hokanson** is working with labs across campus (and across the country) to study the electrical activity of living neurons. With this technique, they can observe how neurons develop and form connections, uncover mechanisms of disease, and search for drugs and treatments capable of affecting brain function. In collaboration with **Colin Johnson**, they are recording neural activity produced by hair cells in fish carrying a genetic mutation linked with human deafness, helping to uncover the causes and potentially guide treatment for this disability.

And in a collaboration with OSU microbiologist **Maude David**, they are developing a cell culture system to simulate and analyze the direct neuronal connection between the gut and the brain to facilitate investigations into ways that gut microbes and diet may impact disorders such as anxiety and Autism Spectrum Disorder. Hokanson is working with the recently-established BENFRA Center at OHSU to help identify and characterize botanical dietary supplements supporting brain resilience in aging. He is thrilled to be helping researchers at OSU and elsewhere to answer important questions about the brain.

Kenton Hokanson

Maude David

First of its kind center

The National Institute of General Medical Sciences of the NIH is funding the establishment of a **Genetic Code Expansion (GCE) Center** at Oregon State, the first ever of its kind. Named GCE4All, the Center launched February 1, 2022, solidifying OSU as the global leader in this powerful tool for protein engineering. **Ryan Mehl** is the center's new director.

Mehl and OSU have gained a reputation over the last decade as a world leader in improving GCE technologies and making them widely available, including through hosting workshops and conferences with attendees from across the globe. GCE enables researchers to modify the genetic code of an organism so it can produce designer proteins that have built into them one or a few special building blocks which contain novel chemical groups – a process that is fostering innovation across the life sciences, medicine and industry.

The new GCE4All center will build on the College's strategic investment in GCE technology, bringing GCE to the masses, catalyzing interdisciplinary breakthroughs and forging a new era of innovation at Oregon State.

Making Us Proud

Department and Alumni News

Scholarships make all the difference

There are eight biochemistry-specific scholarships available to students in our department. For the students who receive them, these scholarships open doors to research, travel and other hands-on experiences to prepare them for their careers. Dorice Goune Goufack (BMB ’22) received one of those scholarships her fourth year. “It’s kind of difficult to study if you have to think about money. Thanks to the scholarship, I was able to focus on my classes. I am forever grateful,” she said. Thanks to the generosity of alumni and friends of the department, we are able to help our students reach their highest potential.

Congratulations to the following scholarship recipients:

Ray & Frances Cripps Biochemistry/ Biophysics Scholarship:
Gretchen Fujimura (2021)

Woodstock Scholarship:
Casey Huggins (2021), **Ebunoluwa Morakinyo** and **Kayleana Green** (2022)

Karen Nickel Biochemistry/ Biophysics Scholarship:
Dourice Goune Goufack (2021), **Kaelin Spring** (2022)

Berge Chandler Scholarship:
Jessica Ewton (2021 & 2022)

Donald L. McDonald Scholarship:
Giulia Wood (2021), **Sahana Shah** (2022)

Kevin & Indira Champions of Undergrads Fund:
Bereket Berhanu (2022)

Mary Hutchins Hohner Scholarship:
Maria Reyna (2022)

Biochemistry/Biophysics Scholarship/ Fellowship Fund:
Aldair Acosta Juarez and **Kitty Liu** (2021), **Avery Ingram**, **Ari Lauthner**, **Zenaida Tygart** and **Coranna Akdemirbey** (2022)

Annual support for BB

The Honor Roll recognizes the Department’s annual supporters who have made outright gifts, pledge payments or new commitments totalling $250 or more in 2021.

Anonymous
AbbVie Incorporated
Indira Rajagopal & Kevin G. Ahern ’86
Amgen Incorporated
Jenean Friedrich Bass ’82 & Michael B. Bass ’82
Marilyn A. & Ronald Bolstad
Children’s Tumor Foundation
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Grace Y. Sun ’66
Takeda Pharmaceutical Company
Kelly G. Tatchell ’79
US 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, 541-737-5820 or Pam.Powell@osufoundation.org.

Dam Proud to be part of BB

As part of Dam Proud Day, OSU's annual day of giving on April 27, 2022, **Kari van Zee** and **Kate Shay** launched a special donations drive specific to the BB department. This was the first year that the department joined the excitement of Dam Proud Day, and we raised $5K for the Biochemistry and Biophysics (BB) Excellence Fund to support undergraduate research, travel to conferences and valuable training opportunities.

"We hope to continue this on future Dam Proud Days," said Shay. "The funds go to support our hardworking students to pursue opportunities that make a big difference in their career preparation." Along with the Biochemistry Club, van Zee and Shay hosted a fun-filled evening social in the Linus Pauling Science Center atrium and auditorium. Students, faculty and family members gathered to celebrate all things biochemistry and biophysics by playing giant Jenga and crystal-themed Kahoot. We topped off the evening with a "protein structure reveal" of an engineered acridone tRNA synthetase by **Ilana Gottfried-Lee** (BMB '21) from the Cooley/Mehl lab.

A new chapter

Graduate students **Kayla Jara**, **Aidan Estelle**, **Jesse Howe**, along with undergraduate **Coban Brooks** established the Oregon Student Chapter of the Biophysical Society in 2021. As a regional chapter, it includes members from across the state of Oregon. On Saturday April 9th, 2022, the Chapter hosted its first annual Oregon Biophysics Symposium hosted at OSU's campus. Events included seminars by our own **Elisar Barbar** and guests from OSU and the University of Oregon, as well as an undergraduate and graduate poster session and a tour of the NMR facility by director **Patrick Reardon**.

Where are they now?

2015 Ph.D. grad **Arden Perkins** (Andy Karplus) accepted a position as an assistant professor at Washington State University's Department of Veterinary Microbiology and Pathology in the School of Veterinary Medicine.

2018 Ph.D. grad **Kelsey Kean** (Andy Karplus) is now an assistant professor of chemistry at High Point University, a private liberal arts university in High Point, NC.

Adding to our catalog

David Hendrix offered the special topics course "Algorithms for Computational Biology," cross-listed with Computer Science, which teaches the fundamentals of algorithms used in computational biology. Students in this course practice leading-edge methods for analyzing biological sequences.

Kate Shay developed a course, "Cancer: Society's Malignant Shadow," to fulfill the objectives of the Difference, Power and Discrimination Baccalaureate Core requirements for undergraduates at OSU. Students learn about cancer from a molecular as well as societal standpoint. They think critically about how trends in cancer diagnosis and treatment are influenced by race, gender and socioeconomic class.

Shay also redeveloped "Molecular Medicine" to help students understand current medical advances from a rapidly evolving molecular point of view. Students demonstrate how events in society shape the development and adoption of medical advances, which are, in turn, themselves determinants of societal change.


Kari van Zee


Kate Shay


Kayla Jara


David Hendrix


Kimberly Webster

Welcome to the team!

The department is pleased to welcome **Kimberly Webster** as our new administrative program coordinator. She grew up in a large family in Corvallis, and now lives west of Philomath with her husband and their two daughters. She worked in the medical field for 7 years before transitioning here to OSU. Her free time is spent either driving her daughters to their after-school activities, gardening and canning, or crafting and organizing.