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ASBMB TODAY

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The Wellness Issue

TAKE A BREATH

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American Society for Biochemistry and Molecular Biology

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Take a breath

By Comfort Dorn

Like a lot of people, since mid-March 2020 I've had some trouble sleeping. I'll conk out as soon as I turn the light off, only to wake up again at 2:30 a.m. At first, my cat got very excited, hoping this was a tweak in her breakfast schedule.

I know I should avoid doom-scrolling on my phone, so I opt for a Sudoku or a soothing novel. After half an hour or so, I turn the light off again and focus on slow, shallow breathing. It doesn't always help me get back to sleep, but I've begun thinking a lot about the act of inhaling and exhaling.

For the most part, unless I'm congested or winded, I don't consider breathing. And yet I go along, keeping myself alive with the oxygen in and the CO_2 out. And sometimes even calming myself down or putting myself to sleep.

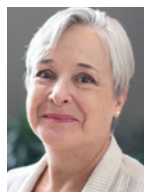
Several of the articles and essays in our January wellness issue of ASBMB Today touch on breathing — what it can do for our minds and bodies and even for our ability to support and care for the people around us.

Breathing, like wellness, isn't something I do just for myself. If I'm going to contribute anything to the world, I need to have a functioning (loosely defined) brain and body. Sometimes I glance at fitness websites and roll my eyes at the sheer narcissism of all that sculpting and supplementing. And, sure, it's about looking good and living long.

But at the heart of it, I think we all take care of ourselves as a gift to those around us as much as to ourselves. If we feel good, we can be more thoughtful, more helpful, more a part of the world.

And it all starts with being sure we have air.

Comfort Dorn (cdorn@asbmb.org) is the managing editor of ASBMB Today. Follow her on Twitter: @cdorn56.



Bumpus takes over at FDA

Namandje Bumpus recently took office as the chief scientist at the U.S. Food and Drug Administration. In this role, she oversees offices dedicated to scientific collaborations, technology transfer, toxicology, regulatory innovations, laboratory safety, counterterrorism, scientific integrity and scientific professional development.

BUMPUS

Bumpus, formerly a professor and chair at Johns Hopkins University School of Medicine's department of pharmacology and molecular science, is also president-elect of the American Society for Pharmacology and Experimental Therapeutics.

Bumpus' research focuses on drug metabolism by enzymes in the cytochrome P450 family, which are responsible for breaking down an estimated three out of every four pharmaceutical compounds. She got started in this field as a graduate student at the University of Michigan, where she earned her Ph.D. in pharmacology studying P450 variants and how they affect drug clearance. She was a postdoc at Scripps Research in La Jolla, California, studying fatty acid metabolism by a different subgroup of P450s.

The Bumpus lab at Johns Hopkins, which she started in 2010, studied how P450 enzymes process antiretroviral drugs, which are used to treat HIV, and antivirals used against hepatitis C. Some of these drugs can cause severe side effects, such as liver failure. Using a combination of mass spectrometry to identify drug metabolites and enzymology to understand how they form, Bumpus' research team worked to understand how such side effects can be prevented.

Starbird honored for work with postdocs, DEI

Chrystal Starbird in July was recognized by the Yale Black Postdoctoral Association, which she co-founded, and the Yale School of Medicine Office of Diversity, Equity and Inclusion for her leadership, mentorship and DEI service. She received the YBPA Distinguished Service Award in DEI at a ceremony near campus.

Starbird is a member of the American Society for Biochemistry and Molecular Biology's 2022 cohort of Maximizing Opportunities for Scientific and Academic Independent Careers, or MOSAIC, scholars. She earned her undergraduate degree at the University of North Carolina at Chapel Hill and her Ph.D. at Vanderbilt University before joining Kathryn Ferguson's lab as a postdoc at Yale. In February, she'll be starting her own lab at the UNC School of Medicine, where she'll be studying the structural changes associated with activation of receptor tyrosine kinases.

STARBIRD

"Being a part of the YBPA and working with the Office of DEI was one of the greatest privileges of my career, and I am so honored to be selected by such an outstanding and inspiring group of leaders for this award," she told ASBMB Today. "As I told them during my acceptance speech, we have started something important and this is just the beginning."

Withers wins RSC Haworth lectureship

Stephen Withers, a bio-organic chemist at the University of British Columbia, in August won the 2022 Haworth Memorial Lectureship, an honor bestowed by the Royal Society of Chemistry.

Withers' lab studies enzymes involved in glycoside cleavage and synthesis, with special emphasis upon their mechanisms. He has numerous other honors to his name, including the Rutherford Medal of the Royal Society of Canada, the Hoffman LaRoche Award of the Canadian Society for Chemistry and the Whistler Award of the International Carbohydrate Organisation.

WITHERS

The lectureship is named for Norman Haworth, a former president of the society, and "is awarded for sustained, internationally recognized contributions to carbohydrate chemistry," according to a news release. The RSC Carbohydrate Group administers the biannual award, and the lecture is presented at its autumn meeting. Withers joined UBC in 1982 and has served as director of its Centre for High-Throughput Biology.

Bielinsky named UVA department leader

Anja Katrin Bielinsky in November took the helm as chair of the University of Virginia School of Medicine's Department of Biochemistry and Molecular Genetics.

In a news release, UVA Health's

chief executive officer, K. Craig Kent, said: "Professor Bielinsky's credentials as an academic researcher are impeccable. Her work has provided important insights into the fundamental causes of cancer. But she has also demonstrated a deep commitment to mentorship, leadership and collaboration throughout her career."

Bielinsky earned her bachelor's, master's and doctorate at Heinrich Heine University in Düsseldorf, Germany. She completed postdoctoral research at Brown University before becoming a faculty member at the University of Minnesota, Twin Cities. In addition to teaching and conducting research at UMN, she has served as the associate dean for foundational science and gender equity at the medical school. Bielinsky studies DNA replication. Over the years, she has been a fellow, and later a scholar, of the Leukemia and Lymphoma Society and a scholar of the American Cancer Society.

BIELINSKY

Bielinsky succeeds David Auble, an American Society for Biochemistry and Molecular Biology member who has been interim chair of the UVA department since March 2021.

Espenshade elected as an ASCB fellow

Peter Espenshade, a professor and associate dean at the Johns Hopkins University School of Medicine, was named a fellow of the American Society for Cell Biology in September.

Espenshade leads a lab that studies regulation of cholesterol homeostasis and cellular responses to hypoxia. He earned his Ph.D. at the Massachusetts Institute of Technology and completed postdoctoral studies with Michael Brown and Joseph Goldstein at the University of Texas Southwestern Medical Center at Dallas. He started his faculty career and lab at Hopkins in 2003, first using yeast as a model system and later using mammalian models to examine control of nutrient homeostasis. In 2012, he was the winner of the American Society for Biochemistry and Molecular Biology's Avanti Young Investigator Award in Lipid Research.

ESPENSHADE

Espenshade and the other newly inducted ASCB fellows were scheduled to be recognized in December at a joint meeting of the ASCB and the European Molecular Biology Organization.

Mentoring award for Heyer

Wolf-Dietrich Heyer, a distinguished professor and chair of the microbiology and molecular genetics department at the University of California, Davis, has received his institution's Distinguished Graduate and Postdoctoral Mentoring Award.

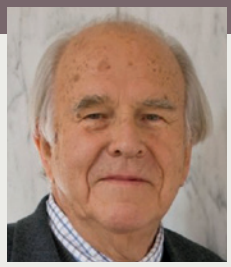
Diedre Reitz, the postdoc who nominated Heyer for the award, praised his leadership through the pandemic. "Wolf was a patient and empathetic supporter ... taking time to hear my concerns as to how the pandemic was affecting my research progress and also me personally," she wrote.

Heyer's lab studies the mechanisms involved in repairing double-stranded DNA breaks. The lab focuses on a primary pathway for these repairs, homologous recombination. To conduct homologous recombination, the cell must identify a double-stranded break in its DNA, find the section of DNA that is homologous with the broken strand on a corresponding diploid chromosome, and then use that DNA as a template to fill in missing sections of the broken strand.

Heyer grew up in Germany and earned his Ph.D. at the University of Bern in Switzerland. After a postdoc at the Dana–Farber Cancer Institute in Boston, he returned to Bern as a group leader in microbiology for several years. He has been a professor at UC Davis since 1998 and chair of his department since 2011. He is a member of the American Academy of Microbiology.

HEYER

Franz M. Matschinsky



Franz Maximilian Matschinsky, a pioneer in the field of glucokinase research and a member of the American Society for Biochemistry and Molecular Biology for four decades, died March 31 in Wallingford, Pennsylvania. He was 90.

Matschinsky was born July 17, 1931, in what is now Poland, and grew up working on his family's farm. After World War II, the family fled to what became West Germany, where he earned a bachelor's degree in basic medical science from Albert Ludwig University in Freiburg and an M.D. from Ludwig Maximilian University in Munich. He conducted postdoctoral studies before serving as an intern at a hospital in Hagen, Germany.

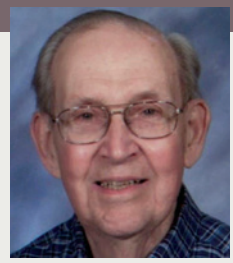
In 1963, Matschinsky moved to the U.S. to take a faculty position at Washington University in St. Louis. There, he studied the metabolism of insulin-producing pancreatic islets. In 1968, he and a colleague observed that the enzyme glucokinase, or GK, is present in beta cells, and he discovered GK's essential sensing role, work that contributed to the scientific understanding and treatment of diabetes.

Matschinsky became a visiting professor at the University of Pennsylvania in 1976 and a full professor there the following year. He spent the rest of his career at Penn, where he chaired the biochemistry and biophysics department and in 1983 was named director of the Cox Institute of Diabetes Research, which became the university's Institute for Diabetes, Obesity and Metabolism.

The American Diabetes Association awarded Matschinsky the Banting Medal for Scientific Achievement in 1995 for his work, and in 2020 he received the Rolf Luft Award from the Karolinska Institutet; his award citation stated that "current knowledge on the role of GK in the beta cell and thereby how GK translates changes in blood glucose concentration into adequate insulin release and thereby regulation of blood glucose homeostasis and why this chain of events is not working properly in diabetes is to a large extent based on work conducted by Dr. Matschinsky over the years."

In his final years, Matschinsky continued to do research and publish articles on the biochemical basis of fuel sensing by pancreatic islet cells. He published more than 300 papers during his career and served as editor-in-chief of the journal Diabetes from 2002 to 2006.

John W. Brown



John Wesley Brown, a chemistry professor who studied links between diet and mental illness and a 60-year member of the American Society for Biochemistry and Molecular Biology, died March 21, in Louisville, Kentucky. He was 96.

Brown was born in Chicago on Dec. 2, 1925, the only child of Earl Jackson and Myrtle Brown. He enlisted in the Army and volunteered for combat at age 18. He served on the front lines in the Battle of the Bulge during World War II and suffered such severe frostbite and trench foot that he was taken out of service on Christmas Day 1944 and hospitalized for 10 weeks. Doctors were able to save his feet, and he was awarded a Purple Heart. After his service, Brown attended Elmhurst College on the GI Bill for a bachelor's degree in chemistry. He then earned a master's degree and a Ph.D. in biochemistry at the University of Illinois Medical Center.

Brown joined the University of Louisville Medical School faculty in 1957. His long career at the U of L included teaching, developing new courses, doing research and serving in administrative positions. In 1964, he received the Kentucky State Medical Association Faculty Scientific Achievement Award. He taught various chemistry courses until he was 78.

In one of Brown's last major research projects, he studied the effect of diet on behavior, teaming up with faculty from the pharmacology, physiology and psychiatry departments of the university's medical school and the psychology department in the college of arts and sciences. Six of his 26 scientific publications related to this research, which focused on how certain amino acids commonly found in food affect the brain when they react with enzymes to produce neurotransmitters. Brown and a psychology professor, John Thurmond, hypothesized that feeding patients high concentrations of the amino acids that help produce serotonin and other neurotransmitters might reduce some symptoms of mental illness.

In retirement, Brown traveled and continued his lifelong hobbies of carpentry and watercolor painting. For years, he designed and built toys for the Salvation Army to distribute at Christmas.

Harold M. Farrell, Jr.

Harold M. Farrell Jr., a dairy biochemist and a member of the American Society for Biochemistry and Molecular Biology since 1981, died March 27. He was 81.

Born Sept. 5, 1940, in Pottsville, Pennsylvania, he was the son of Marie and Harold Farrell Sr. He received a bachelor's degree in chemistry from Mount Saint Mary's College of Maryland in 1962. He earned his master's and Ph.D. in biochemistry from Pennsylvania State University and then spent a year as a National Academy of Sciences postdoctoral fellow at the U.S. Department of Agriculture's Eastern Regional Research Center in Philadelphia, known as the ERRC. He married Susan Gares during graduate school.

Farrell led the Biochemical Investigation Group and then the Chemistry of Lipids Research Unit at the USDA until 1991. He remained a lead scientist in the Dairy Products Laboratory at the ERRC, studying the chemistry and biochemistry of milk proteins, until his retirement in 2003. Farrell continued to work after his retirement in an emeritus position for about 14 years. He also served on the National Dairy Board.

Farrell is a highly cited researcher in the field of dairy biochemistry. He is noted particularly for his work on milk protein casein. He studied mechanisms underlying the phosphorylation of casein and the effects of temperature and calcium on casein structure. In his later years, he exploited the property of caseins in binding transition metals for use as natural antioxidants in oil-in-water emulsions.

Farrell was a Boy Scout leader, coached his son's soccer teams and served on his local library board. He was an active leader in his church and sang tenor in the choir for more than 40 years.

He is survived by his wife, Susan; two children, Judith Farrell Northrop and Jonathan Kent Farrell, and their spouses; and four grandchildren.

— Kanika Khanna

Upcoming ASBMB events and deadlines

JANUARY

10	Deuel abstract deadline
18	Discover BMB late-breaking abstract submission deadline (poster presentation only)
31	Discover BMB early bird registration deadline
31	Deuel deadline for cancellation/refunds
31	Marion B. Sewer scholarship application accepted

FEBRUARY

1	Deuel registration deadline
4	Honor society application deadline
14	Discover BMB housing deadline
24	PROLAB application deadline

MARCH

7–10	**ASBMB Deuel Conference on Lipids**
23	Discover BMB regular registration deadline
24	Discover BMB on-site registration
25–28	**Discover BMB 2023, Seattle**

2022 MOSAIC cohort complete

By Angela Hopp

The American Society for Biochemistry and Molecular Biology welcomed seven more scholars in September to its second cohort for the Maximizing Opportunities for Scientific and Academic Independent Careers, or MOSAIC, program, bringing the 2022 total to 15.

"With each new group of talented scholars, I grow more inspired for the future of our discipline," said Kirsten Block, director of education, professional development and outreach at the ASBMB. "I'm excited for the professional-development journey we will embark upon together through the MOSAIC program. I can't wait for the ASBMB community to meet them in Seattle next spring at our new annual meeting, Discover BMB."

Mary C. Andorfer

Mary C. Andorfer is starting her lab as an assistant professor at Michigan State University in the fall of 2023.

Andorfer, a native of Indiana, attended high school in Fort Wayne and then Butler University in Indianapolis. As a graduate student at the University of Chicago, Andorfer used directed evolution to engineer site-selective halogenases capable of chlorinating and brominating a wide array of aromatic small molecules under mild conditions. During that time, and for a little while after earning her Ph.D. in 2017, she also worked with the Novartis Institutes for Biomedical Research in Massachusetts.

She then moved to Catherine Drennan's lab at the Massachusetts Institute of Technology, where she studied anaerobic enzymes in the human gut microbiome and in crude oil–polluted environments. She plans to continue research on the latter in her new lab in Michigan. Her MOSAIC project is titled "Investigation and application of hydrocarbon-degrading enzymes using cryo-electron microscopy and directed evolution."

"The MOSAIC program allows me the amazing opportunity to continue developing effective, inclusive mentoring strategies that will help me towards my goal of creating a diverse, collaborative research lab," she said. "I'm very excited to be a part of this cohort and support each other's growth as scientists and teachers."

Alex Guseman

Alex Guseman is a postdoc in Angela Gronenborn's structural biology lab at the University of Pittsburgh. He started out studying the mechanisms of cataract formation but, like a number of scientists, made a quick pivot in response to the COVID-19 pandemic.

"In summer of 2020, we were rapidly searching for anything that could inhibit SARS-CoV-2," Guseman explained. "At the time, I had just submitted a manuscript and had relatively free hands. Angela and I talked it over and decided I would purify a few lectins to test. If any of them had activity, I would be able to run with it and make it into a project. As one might guess, they had activity, and thus I am still working on the project." It is titled "Developing lectins as inhibitors of coronavirus spike proteins."

A Marylander, Guseman was raised near Baltimore and interned during high school at a biotech company before pursuing his bachelor's in biochemistry at the University of Maryland, College Park. He moved in 2014 to the University of North Carolina at Chapel Hill to pursue his Ph.D. During his graduate studies, he studied protein dimerization in cells and cell-like environments using nuclear magnetic resonance. He joined the Gronenborn lab in 2018 as a postdoc.

"I am thrilled to join the ASBMB MOSAIC cohort. I have looked up to many of these fantastic scientists for years, and I am excited to learn from them," he said. "As part of the ASBMB community I am looking forward to harnessing this network for advice as I prepare to transition to my own independent career."

Josiah Hardesty

Josiah Hardesty is a postdoc in the lab of Irina Kirpich at the University of Louisville, where he is studying the mechanisms of impaired liver regeneration in alcohol-associated liver disease and evaluating metabolic treatment strategies. His MOSAIC project is titled "Restoration and preservation of hepatic cardiolipin levels promotes liver regeneration in AH."

About the ASBMB MOSAIC program

In 2020, the ASBMB received a cooperative agreement with the National Institute of General Medical Sciences to develop and execute a program that will support postdoctoral fellows and new investigators from diverse backgrounds embarking on careers at research-intensive institutions.

Each participant is paired with a coach at a different institution. In addition, each cohort is anchored by a coach, building a community of practice. Importantly, all coaches are trained to discuss and respond appropriately to issues relating to gender, race and culture, including, for example, stereotype threat and microaggressions.

The program offers scholars network-building opportunities, science communication training and platforms, and grant-writing and other skill-building workshops and webinars.

Hardesty was born in Hartford, Kentucky. "I was always interested in science but I couldn't really picture a career in science until I experienced basic research in college," he said. Hardesty earned his bachelor's in biology at the University of Kentucky in 2013.

At the University of Louisville, he earned both a master's and a Ph.D. in biochemistry and molecular genetics. His doctoral thesis was on the mechanisms of toxicant-associated steatohepatitis.

During graduate school, Hardesty served as doctoral student president. During his term, he provided grant-writing advice to pre- and postdoctoral students. He also hosted Nobel laureate and fellow Kentuckian Phillip Sharp for a lecture on campus. "This was a momentous occasion for me and other underrepresented students because Dr. Sharp was a symbol of what I and other students from Kentucky could achieve in biomedical sciences no matter our background," he said.

He joined the Kirpich lab as a postdoc in 2018.

"The MOSAIC award will allow me to start my independent research career and train future scientists who are from underrepresented and disadvantaged backgrounds," he said.

Sara J. Codding

Sara J. Codding is a postdoc in the lab of Matthew Trudeau at the University of Maryland, Baltimore.

A first-generation college graduate from Northern California, Codding earned her bachelor's in chemistry from Cal Poly Humboldt, then worked in the pharmaceutical industry for two years.

She earned her Ph.D. in biochemistry and biophysics in 2017 at Oregon State University, where she studied the in vitro membrane binding and SNARE effector properties of the calcium-binding protein dysferlin, which is associated with a form of adult-onset muscular dystrophy. At OSU, Codding was a grad student union representative and a member of the contract-bargaining team.

As a postdoc, Codding now studies the potassium-selective voltage-gated ion channel hERG responsible for ventricular repolarization of the heart. Mutations in hERG cause type 2 long QT syndrome and sudden cardiac death, and off-target effects of pharmaceuticals cause acquired long QT syndrome, a common clinical problem. In the Trudeau lab, she's incorporating noncanonical amino acids into hERG channels that act as probes to visualize and reveal the dynamics of channel gating. Using transition metal ion FRET, where noncanonical amino acids serve as FRET donors to dipole-independent transition metal FRET acceptors, she is measuring the absolute distances between domains during channel gating on the angstrom level. She said she hopes that, with use of these measurements as structural constraints for Rosetta modeling, this work will lend insight into ion channel dynamics lost in disease states and theories of hERG drug promiscuity. Her MOSAIC project is titled "Visualizing the divergent conformational dynamics of KCNH channels."

Codding serves as a diversity and inclusion representative for UMB's neuroscience program and on the executive council of the Society of General Physiology. She looks forward to "continuing to promote diversity and inclusion in STEM fields as an early-career scientist and MOSAIC scholar."

As an ASBMB member, Codding intends "to develop a strong scientific community of collaboration and mentorship that will continue throughout my career."

Pearl Magala

Pearl Magala is a postdoctoral fellow at the University of Washington.

A native of Uganda, Magala said her interest in science and medicine was sparked at a young age "by seeing the misery of millions of people dying from preventable and treatable diseases … due to lack of access to health care."

As an undergrad at Mount Holyoke College, she worked in multiple labs and was determined to "contribute to medicine by understanding the molecular basis of disease and therefore develop effective treatments."

Magala pursued a Ph.D. in chemistry at Johns Hopkins University. For her thesis, she used NMR in studies of the ubiquitin-conjugating enzyme Ube2g2.

She then moved to the lab of Rachel Klevit at the University of Washington, where she used primarily NMR to study the structures and conformational dynamics of bacterial adhesion proteins.

She took a job at AbbVie last year but returned to the Klevit lab for her MOSAIC project, "Investigating novel methods to combat urinary tract infections."

"I am excited to tap into the career-development opportunities and to expand my professional networks through the ASBMB program for MOSAIC scholars. These opportunities will be invaluable in establishing a strong research program," Magala said.

Long term, she hopes that her research will aid in developing low-cost treatments for bacterial infections, and she plans to mentor students from minoritized groups and low-income communities.

Vivien Ileana Maltez

Vivien Ileana Maltez is a postdoc at the National Institute of Allergy and Infectious Diseases; she's studying the cellular interactions that dictate tumor responsiveness to immunotherapy.

Maltez grew up in Glendora, a suburb of Los Angeles. Her parents were teachers and engaged her in many creative projects, such as building race cars from mouse traps.

Maltez attended Scripps College, majoring in molecular biology, and then the University of North Carolina at Chapel Hill's Postbaccalaureate Research Education Program. She continued on at UNC, earning her doctorate in microbiology and immunology in 2017. Her thesis was about bacterial pathogenesis and cell death.

Now, as a postdoc at the NIAID, Maltez works with physician–scientist Ronald Germain, who leads the Center for Advanced Tissue Imaging. Maltez was selected for the Postdoctoral Research Associate Training Program and has been using imaging to acquire spatial information about the tumor microenvironment. Her MOSAIC project is titled "Multiplex imaging in therapy refractory tumors: Understanding the facets of an immunosuppressive environment."

Throughout grad school and her postdoc, Maltez has been a mentor through the PREP program to underrepresented minority students and has participated in science outreach programs serving K–12 students.

"I am thrilled to be a part of such a talented cohort dedicated to supporting the growth of underrepresented minorities in the biomedical sciences. The diversity within this MOSAIC community, both personal and scientific, provides a uniquely amazing opportunity to interface with the leaders of the future," she said.

Andrew Santiago–Frangos

Andrew Santiago–Frangos is a postdoc in Blake Wiedenheft's lab at Montana State University, where he studies how bacteria regulate their anti-phage CRISPR adaptive immune systems. He is interested in repurposing these fundamental insights for scientific and medical applications and has co-invented a CRISPR-based diagnostic.

Santiago–Frangos is a Puerto Rican Cypriot. After graduating from high school in Cyprus, he interned at a biotech in San Diego. He then moved to England to pursue his bachelor's in biochemistry at the University of Leicester. During that time, he interned at GSK.

After earning his undergraduate degree in 2012, he was lured to Baltimore to pursue his Ph.D. in biology at Johns Hopkins University. His thesis work determined how an intrinsically disordered domain within the ubiquitous bacterial RNA chaperone Hfq regulates protein–RNA interactions.

He also has been a committed mentor to high school and undergraduate students, two of whom recently won Goldwater scholarships.

"I've already had many supportive interactions with other members of the ASBMB MOSAIC community," he said. "I look forward to the additional mentorship, professional development, and training I will receive. … This opportunity will enhance my ability to promote diversity and inclusion in science as a principal investigator."

Angela Hopp (ahopp@asbmb.org) is executive editor of ASBMB Today and communications director for the ASBMB. Follow her on Twitter: @angelahopp.

Breaking barriers: First generation to inspiration

By Elisa Marie Wasson

As a child, Alberto A. Rascón Jr. dreamed of becoming a professional athlete, but an injury in college ended his football career, so he had to go back to the drawing board.

While he was healing and contemplating what to do next, he ran into his high school chemistry teacher. When Rascón shared his emerging interest in chemistry, his teacher discouraged him, saying he wouldn't pass and would end up dropping out. But Rascón has always faced challenges head on.

His response: Challenge accepted.

Rascón grew up in Culver City, California, and had few role models in science. "Growing up where I grew up, I mean, we were a low-income household," he said. "I lived in the ghetto, and everyone used to tell me, 'You're not going to do it. You're not going to amount to much.'"

Driven to prove the naysayers wrong, he decided to major in chemistry. Not thrilled with inorganic or organic chemistry, he began to take biology classes — and a light bulb went on. The combination of chemistry and biology proved to be the magic ticket that set him on a trajectory to becoming a biochemist.

The importance of mentorship

Rascón found a mentor in Ted Weinheimer, a biology professor at California State University, Bakersfield, where his grade point average went from a 3.0 to a 3.86 in two years. The mentor–mentee relationship didn't always come easy for Rascón. "The way I was brought up, living in the hood, we never trusted anybody outside of our circle," he said. "Especially older, white men because I didn't know if they would have my best interests at heart."

COURTESY OF ALBERTO RASCÓN

Alberto A. Rascón Jr. is an assistant professor at San Jose State University and a member of the ASBMB's Maximizing Access Committee.

But working with Weinheimer changed his views. "He really took the time to ask how I was doing as a person. He really wanted to know me and my struggles. He uplifted me big time."

With his mentor's guidance, Rascón decided to pursue his Ph.D. in biochemistry at the University of Arizona.

As a first-generation college student, Rascón found it difficult to navigate his Ph.D program. He faced challenges with his first adviser. He and his wife were raising two young children, and he struggled to balance his Ph.D. work with family responsibilities.

Stressed and on the brink of quitting grad school in his fourth year, Rascón reached out to Weinheimer, who encouraged him to talk with his committee members and, eventually, to change labs.

"I thought I was done with science. I hated science," Rascón said. "Once I made the switch, oh my gosh, I had so much fun."

When he began working with Roger Miesfeld, Rascón hit the ground running. In just two years, he wrote two manuscripts and a National Institutes of Health RO1 grant on Aedes aegypti mosquito midgut proteases. The female A. aegypti is a carrier for yellow fever, dengue fever, chikungunya and Zika viruses, and of those, only yellow fever has a licensed vaccine. By studying midgut proteases — the digestive enzymes that break down blood meals and provide the mosquito energy to lay eggs — Rascón and his colleagues could develop inhibitors to prevent digestion and halt the egg-laying process.

Within nine months of starting in the lab, Rascón developed a method to detect mosquito protease activity in real time as opposed to existing end-point assays that failed to capture the early and late phases of activity. But midgut protease levels are insufficient to purify active proteases directly from mosquitos, so he

COURTESY OF ALBERTO RASCÓN

Because the students in Rascón's lab learn a variety of skills, several biotech companies regularly recruit them.

needed a new method to characterize and study the protease activity in the lab. As a result, in his second paper, Rascón produced, for the first time, recombinant active proteases.

"The lab environment was amazing," he said, "and it really transformed my perspective not only on how to do science, but also manage people in the field."

Driven by his desire to teach and to continue learning how to manage a lab, Rascón was awarded a National Institutes of Health Institutional Research and Academic Career Development Award, known as IRACDA, and became a postdoctoral scholar at the University of California, San Francisco, under James McKerrow, studying parasitic proteases. There he learned a philosophy of teaching from his eventual good friend and teaching mentor, Teaster Baird.

"I learned a lot from him on how to deliver material, how to teach students, and how to be student centric," Rascón said. "If you really lecture to the students and think about them and their needs, adjust as you teach, it makes for a better teaching and learning experience."

Inspiring the next generation

Taking what he learned as a postdoc at UCSF, Rascón accepted an assistant professor position at San Jose State University. The administration asked him to teach the senior biochemistry lab. With no curriculum to guide his teaching, Rascón completely revamped the class to teach students lab skills and give them a chance to delve into research. Working with mosquitoes, his students learned to analyze a gene sequence, design primers for polymerase chain reaction gene amplification, clone the genes into a vector, and then do recombinant protein expression and even perform activity assays.

In Rascón's first year teaching the class, one of his students found a new commercially available strain of E. coli bacteria that have a more oxidizing cytoplasm than the strain Rascón had used in his graduate school work to clone the mosquito proteases. This enabled proper folding of the proteases and allowed them to stay in solution. Using these cells, the lab produced soluble, recombinant proteases, eliminating the need for a denaturation/renaturation scheme that had reduced yield in Rascón's previous work.

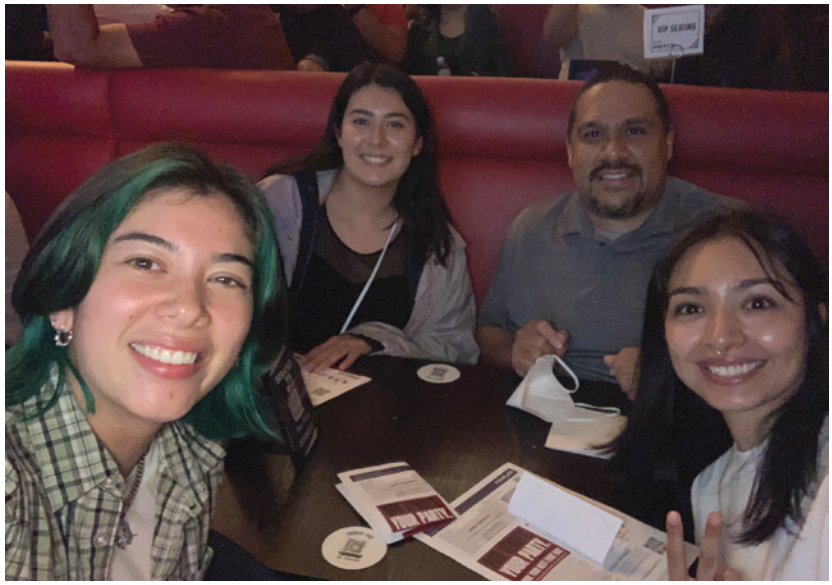
The lab published a manuscript on this work in 2018, which fostered collaborations with the University of California, San Diego; UCSF; the University of Arizona and the New York Blood Center. Because of the skills Rascón's students learn, several biotech companies regularly recruit them, and in the fall semester of 2021, six students obtained jobs in biotech.

Rascón encourages his students to maintain a good work–life balance and helps them manage their time in the lab and in class. Just as his

mentors encouraged him to take time for his family and be efficient, he passes on the same advice and understanding to the students in his lab: "Manage your time properly. Make a calendar and block off time. If you can't finish an experiment, I'm here. Let me know and I will take a sample if you can't do something. I'm here."

He also stresses happiness. "I tell my students, 'Science is 99% failure. Are you comfortable with that? You have to make sure that you're first and foremost happy. Once you have happiness then everything else will fall into place.'"

Rascón serves as a co-coordinator for the NIH Research Training Initiative for Student Enhancement, or RISE, program and won the 2021 College of Science Research with and Mentoring of Students Award at SJSU. "I would like to think my bad experiences have made me a very good mentor," he said. "People can either make you love or hate science. I want to give my students an environment where they are going to be successful."



COURTESY OF ALBERTO RASCÓN

Rascón likes to encourage his students to maintain work–life balance with activities such as taking them to a night of improv theater in San Jose.

Rascón is clear about his main motivation. "I do it because of my students," he said. "I do it because they inspire me to be there for them and be the mentor that they need. I'm going to transform science one way or another. We need great scientists, but you also need to live and have fun."

Elisa Marie Wasson
(ewasson1@gmail.com)
is a materials engineer at Lawrence Livermore National Lab in the Bioengineering and Advanced Fabrication group, where she works on cell microencapsulation and tissue engineering. She received her bachelor's degree in mechanical engineering from the University of New Mexico and her Ph.D. from Virginia Tech.

ASBMB committees welcome new members

And bid adieu to those whose terms have ended

By ASBMB Today staff

The American Society for Biochemistry and Molecular Biology welcomed many new committee members in the fall. Some of them were elected by the membership, and others applied and were appointed by the committees.

Learn about the committees and see the new members below.

Education and Professional Development Committee

The Education and Professional Development Committee encourages and supports the development of a vibrant and inclusive community of biochemists and molecular biologists by promoting effective molecular life sciences curricula and educational practices and by providing career resources across the professional life cycle.

These newly appointed members will serve through 2025:

- Rou-Jia Sung (Carleton College)
- Paula Lemons (University of Georgia)
- Bruno Rodrigues (Federal University of Rio de Janeiro)
- John Tansey (Otterbein University)

The following members' terms ended in 2022:

- Cheryl Bailey (Mount Mary University)
- Chris Peña (Purohit Navigation)
- Rita-Marie Raach (Lincoln College Preparatory Academy High School)

Finance Committee

The Finance Committee assists the Council in fulfilling its financial oversight responsibilities by monitoring the society's financial resources, including budgeting and financial planning, financial reporting, internal controls and accounting policies, and investment fund strategies.

The following committee member's term was renewed through 2027:

- Gerald Wilson (University of Maryland School of Medicine)

Meetings Committee

The Meetings Committee facilitates organization of meeting programs to deliver groundbreaking scientific research, promote networking and mentoring opportunities, and foster relationships and collaboration between scientists around the globe. With a forward-thinking strategy, the meetings committee recommends new scientific areas and programming to expand the reach and engagement of ASBMB members and the larger BMB community.

The co-chairs for the ASBMB annual meeting, Discover BMB, will serve through 2023.

- Karen N. Allen (Boston University)
- Craig Cameron (University of North Carolina School of Medicine)

These new members will serve through 2025:

- Martha Cyert (Stanford University)
- Aaron Hoskins (University of Wisconsin–Madison)
- James Olzmann (University of California, Berkeley)
- Kim Orth (University of Texas Southwestern Medical Center)
- Saumya Ramanathan (Arizona State University)
- Jared Rutter (University of Utah School of Medicine)

The following members' terms expired in 2022:

- Cheryl Bailey (Mount Mary University)
- Enrique M. De La Cruz (Yale University)
- Patrick Grant (Florida Atlantic University College of Medicine)

- Chad Slawson (University of Kansas Medical Center)
- Blanton S. Tolbert (Case Western Reserve University)
- Yan Jessie Zhang (University of Texas at Austin)

Membership Committee

The Membership Committee focuses on the retention, growth and engagement of the ASBMB membership. The committee is charged with considering, reviewing and recommending actions to implement programs, benefits and services to advance the mission of the society and meet the needs of its members.

These newly appointed members will serve through 2025:

- Mark Witmer (Bristol Myers Squibb)
- S. Patricia Becerra (National Eye Institute of the National Institutes of Health)
- Melanie McReynolds (Pennsylvania State University)

These members' terms will expire in the spring of 2023:

- Pete Kennelly (Virginia Tech)
- Bettie Sue Masters (Duke University)
- Renee Yura (Pfizer)

Maximizing Access Committee

The mission of the Maximizing Access Committee (formerly the Minority Affairs Committee) is to ensure that diversity, equity and inclusion are a priority throughout the society to advance life sciences research and education. The MAC strives to increase the presence, visibility, access and support of historically excluded and marginalized groups by advocating for policies and developing resources to promote more diverse, equitable and inclusive practices.

There are five newly appointed members whose terms will end in 2025:

- Stephen Williams (Baylor College of Medicine)
- Jose Rodriguez–Martinez (University of Puerto Rico Rio Piedras)
- Oluwarotimi Folorunso (McLean Hospital/Harvard Medical School)
- Yass Kobayashi (College of St. Scholastica)
- Anita Nag (University of South Carolina Upstate)

The committee thanks the following for their service:

- Deborah Neely–Fisher (J. Sargeant Reynolds Community College).
- Cecilia Giulivi (University of California, Davis)

Nominating Committee

The ASBMB Nominating Committee nominates regular members of the society to stand for election for president, Council, Publications Committee and the Nominating Committee. Committee members are elected for three-year terms and can be reelected or reappointed to serve one additional term.

The committee has three new members — two elected by the membership and one appointed — whose terms will end in 2025:

- Juan Mendoza (University of Chicago)
- Jeremy Thorner (University of California, Berkeley)
- George Carman (Rutgers University)

The following committee members' terms ended in 2022:

- Celia Schiffer (University of Massachusetts Medical School)
- Nicholas Tonks (Cold Spring Harbor Laboratory)
- Wei Yang (National Institutes of Health)

Public Affairs Advisory Committee

The Public Affairs Advisory Committee monitors and responds to all matters relating to the government's role in the practice of science. The committee advises the society leadership on governmental issues in which the membership has an interest.

Three new committee members were appointed to serve through 2025:

- Olivia George (University of Hawai'i–West O'ahu)
- Karen Lewis (Texas State University)
- Kevin Gardner (City University of New York Advanced Science Research Center)
- Emily Pitsch (University of Utah)

The terms of the following members expired in 2022:

- Susan Forsburg (University of Southern California)
- Susan Baserga (Yale University)
- Terri Kinzy (Illinois State University)

Publications Committee

The ASBMB Publications Committee oversees the society's scholarly publishing activities, advises the Council on policy and ethical issues that may arise, and advises journal editors about editorial matters, including the approval of associate editor appointments. Committee members are elected for five-year terms and can be reelected or reappointed to serve one additional term.

ASBMB members elected four new committee members, whose terms end in 2027:

- Walid Houry (University of Toronto)
- Marcelo Kazanietz (University of Pennsylvania)
- Daniel Leahy (University of Texas at Austin)
- Anne-Frances Miller (University of Kentucky)

The following committee members' terms ended in 2022:

- Brian Crane (Cornell University)
- Robert Haltiwanger (University of Georgia)
- Ruth Welti (Kansas State University)
- Tanya Paull (University of Texas at Austin)

Science Outreach and Communication Committee

The Science Outreach and Communication Committee develops science communication training and facilitates outreach activities for the society. The committee provides resources and professional-development opportunities for ASBMB members to get involved with informal education in their communities. The SOCC's mission is to increase and expand the effectiveness of inclusive and accessible science outreach and communication activities through the involvement of ASBMB members.

These newly appointed members will serve through 2025:

- Joanna Kwiatek (Polonium Foundation)
- Debra Martin (St. Mary's University of Minnesota)
- Greg Miller (Catholic University of America)

The following members' terms ended in 2022:

- Stuart Ravnik (University of Texas Southwestern Medical Center at Dallas)
- Edwin Li (St. Joseph's University)
- Niki Woitowich (Northwestern University)

Student Chapters Committee

The Student Chapters Committee is devoted to building a national community of undergraduate students and faculty members for the advancement of biochemistry and molecular biology research, education and science outreach. It provides networking and career-development opportunities at regional and national levels, access to research and science outreach, and grants and awards.

The following new member will serve through 2025:

- Betsy Martinez–Vaz (Hamline University)

One member's term ended in 2022:

- Debra Martin (St. Mary's University of Minnesota)

Women in Biochemistry and Molecular Biology Committee

The Women in Biochemistry and Molecular Biology Committee advocates for women in biochemistry and molecular biology, both in academia and in industry, by increasing participation, visibility and status of women within the scientific community.

The following members were appointed and will serve through 2025:

- Alexandra Kent (University of California, Berkeley)
- Nicole Koropatkin (University of Michigan)
- Sudha Sharma (Howard University)

The following members' terms expired in 2022:

- Sonia Flores (University of Colorado Anschutz Medical Campus)
- Vahe Bandarian (University of Utah)
- Marina Ramirez–Alvarado (Mayo Clinic)

Did you remember to renew your membership?

Please take a moment to renew your American Society for Biochemistry and Molecular Biology membership at asbmb.org. Contact us at membership@asbmb.org or 240-283-6604 if you need assistance.

New JBC associate editors

Sarah O'Connor, Philip Cole and Joan Broderick are the Journal of Biological Chemistry's newest associate editors. O'Connor's lab at the Max Planck Institute for Chemical Ecology studies natural product biosynthesis. Cole is a physician–researcher at Harvard Medical School, where his lab studies posttranslational modifications in the context of signaling, epigenetics and cancer.

O'CONNOR

BRODERICK

O'Connor and Cole started their terms in May. Broderick is an authority in enzymology at Montana State University, where she leads the chemistry and biochemistry department. Her lab focuses on iron–sulfur clusters, biological radical reactions and biological metal cluster assembly. She starts her term in January.

COLE

New data integrity team member

Jordan Anderson joined the ASBMB publications department as an image analyst in October. A digital content creator with a background in graphic design and photography, Anderson has a bachelor's in communications from Bowie State University, where she also minored in business. She also has an associate's degree in information technology from Prince George's Community College.

It's certification exam registration time

The 2023 ASBMB degree-certification exam registration window runs from Jan. 17 through Feb. 17. The certification exam is open to all undergraduate students enrolled in ASBMB-accredited programs and is designed to test students' knowledge and understanding of the core competencies in biochemistry and molecular biology developed by the ASBMB and its members. Find out more at asbmb.org/education/certification-exam.

Now accepting applications for Sewer scholarship

The ASBMB supports the advancement of diversity, equity and inclusion in science by offering the Marion B. Sewer Distinguished Scholarship to students who show demonstrated interest in the fields of biochemistry and molecular biology and enhance diversity in science. This award provides up to $2,000 toward undergraduate tuition costs for one academic year. Applications will be accepted until June 1. Apply at asbmb.org/diversity/undergraduate-scholarship.

ASBMB makes recommendations to improve data equity

The ASBMB public affairs department and Public Affairs Advisory Committee made several recommendations to the White House Office of Science and Technology Policy to facilitate increased data sharing between different levels of government, include more data on minority-serving institutions in federal agency databases, and better practices when collecting data on gender identity and sexual orientation. Read the full comment letter on asbmb.org/advocacy/letters.

NIH Center for Scientific Review incorporates ASBMB's recommendations

In March, the ASBMB was one of 13 scientific societies to make recommendations to the National Institutes of Health Center for Scientific Review's draft strategic plan. The CSR released its final strategic plan in October and incorporated two notable policy recommendations the society made: (1) integrate diverse communities as stakeholders in the peer-review process and (2) ensure CSR staff and reviewers are trained properly to mitigate bias. Read more at asbmb.org/asbmb-today/policy.

Epigenetic regulation in JBC

The ASBMB hosted a meeting on the interplay between epigenetic regulation and genome stability in September in Seattle. In a virtual companion issue, Journal of Biological Chemistry editors present 10 recent articles celebrating advances in this important and fast-moving field. Read the issue at jbc.org/epigenetic-regulation-in-jbc.

RNA polymerase II and transcriptional regulation

The ASBMB held its conference titled Transcriptional Regulation: Chromatin and RNA Polymerase II in September in Snowbird, Utah. In a virtual companion issue compiled by the Journal of Biological Chemistry, the editors present 10 recent articles showcasing new related research. Read the issue at jbc.org/rna-polymerase-ii-and-transcriptional-regulation.

Immunopeptidomics in MCP

Experts and opinion leaders in immunopeptidomics share their findings and views of this blossoming field of research in a special issue of Molecular & Cellular Proteomics. Read the issue at mcponline.org/special-issue-immunopeptidomics.

Jan. 10: Abstract deadline for Deuel lipids conference

The ASBMB Deuel conference is a must-attend event for leading lipids investigators — and for scientists who've just begun to explore the role of lipids in their research programs. This event will bring together a diverse array of people, including those who have not attended Deuel or perhaps any lipid meeting before. The conference is a forum for the presentation of new and unpublished data, and attendees enjoy the informal atmosphere that encourages free and open discussion. Interested scientists are invited to submit abstracts by Jan. 10. Learn more at asbmb.org/meetings-events/deuel.

Jan. 18: Late-breaking abstracts due for #DiscoverBMB

If you plan to present your work at the ASBMB's annual meeting, the late-breaking abstract submission deadline is Jan. 18. All accepted abstracts will be published in the Journal of Biological Chemistry. The early-bird registration deadline is Jan. 31, and the housing deadline is Feb. 14. Visit discoverbmb.asbmb.org.

Feb. 4: Nominations for the ASBMB Honor Society due

Student Chapter members are eligible for election into the ASBMB Honor Society, XΩΛ. The honor society recognizes juniors and seniors demonstrating exceptional achievement in academics, research and science outreach. Nominate at asbmb.org/education/student-chapters/honor-society.

Feb. 4: Nominations for Outstanding Chapter Award due

Each year, the ASBMB recognizes a Student Chapter that excels in its leadership, scholarship and service in the areas of biochemistry and molecular biology. A winning chapter, selected for its demonstrated track record of accomplishments at both the chapter and the individual level over the past year, will be honored at #DiscoverBMB in March in Seattle. All active chapters are eligible to apply at asbmb.org/education/student-chapters/awards/outstanding-chapter.

Feb. 25: Applications for PROLAB due

The Promoting Research Opportunities for Latin American Biochemists program allows grad students and postdocs to spend up to six months in U.S. or Canadian laboratories. Since 2012, the ASBMB, the Pan-American Society for Biochemistry and Molecular Biology, and the International Union for Biochemistry and Molecular Biology have issued about 100 PROLAB travel awards.

Trainees and new investigators (not more than five years past postdoc work) from countries active in the PABMB, including Spain and Portugal, are invited to apply by Feb. 25 at asbmb.org/career-resources/awards-grants-fellowships/prolab.

Join the Art of Science Communication mailing list

Do you want priority notification the next time we host the Art of Science Communication course? Join the ASC mailing list for access to the course application two days before it is widely available. Mailing list recipients also receive information about other ASBMB science communication offerings. Sign up at asbmb.org/career-resources/communication-course/mailing-list.

A productive internship

Hecmarie Meléndez–Fernández spent the fall as an intern with the ASBMB education, professional development and outreach team. A neuroscience Ph.D. candidate at West Virginia University, Meléndez–Fernández orchestrated virtual events for early-career scientists interested in academic careers. The first, a webinar about determining your leadership style and establishing guiding documentation for lab members, was held in November, and others will roll out through the spring.

Disrupting a channel to regulate depression

By Chloe Kirk

Major depressive disorder, or MDD, affects 17% of adults in the U.S. Even with treatment, many patients experience refractory symptoms and may experiment with multiple medications to find a pharmacotherapy that works. Even effective therapies can be hindered by side effects such as changes in weight and sleeping habits.

Nearly all existing antidepressants target neurotransmitters such as serotonin. However, a recent breakthrough in a Vanderbilt University Medical Center lab regulates protein–protein interactions in the brain and could offer one new path to treatment.

Dane Chetkovich's lab has long been interested in MDD and how it can be treated by targeting ion channels in the hippocampus. Ye Han, a research associate professor in the lab, and colleagues recently published a paper in the **Journal of Biological Chemistry** announcing the discovery of a small molecule capable of disrupting a key pathway in the brain linked to the disorder.

Researchers in the lab had found previously that hyperpolarization-activated, cyclic nucleotide-gated — or HCN — channels are elevated in people with MDD as well as in animals that have been genetically altered to experience chronic social stress. This was an important breakthrough in understanding the disorder and provided a molecular target for developing new therapies. However, HCN channels are present in both the heart and the brain, and compounds designed to limit HCN channel function can produce heart arrhythmias.

"We know HCN is the therapeutic target, but we needed a way to exclusively target these channels in the brain," Han said. "We need to be able to target HCN indirectly."

As far back as 2010, Han and Chetkovich were studying a supporting subunit of HCN channels that can regulate HCN channel activity specifically in the brain. This subunit is called tetratricopeptide-repeat containing, Rab8b-interacting protein, or TRIP8b. It binds to HCN pore-forming subunits to regulate HCN channel function and subcellular distribution.

TRIP8b turned out to be the key to unlocking HCN channel regulation in MDD. When TRIP8b is knocked out in the brains of animals, HCN channel expression decreases.

Han took this discovery a step further in the work described in this recent JBC paper, using a high-throughput virtual screen to identify a small molecule, NUCC-0200590, that can disrupt the HCN–TRIP8b interaction both in the test tube and in animals.

The lab now is working on developing this small molecule into a drug that could be used in the clinic. This means screening to test analogs and concentrations for their effect on the HCN–TRIP8b interaction to improve potency and stability, with the long-term goal of bringing it to a clinical trial.

"This novel approach takes advantage of a specific mechanism found only in the brain and has the potential to improve how MDD is treated," Han said.

DOI: 10.1016/j.jbc.2022.102069

Chloe Kirk (cck22@miami.edu) is working toward her Ph.D. in biochemistry and molecular biology at the University of Miami. Her interests are science research, communication and outreach. Follow her on Twitter: @chloeckirk

How a fish pathogen outwits antibiotic stress

By Sneha Das

Researchers have discovered a novel antibiotic-resistance mechanism in Aeromonas hydrophila that allows this bacterium to change its antibiotic susceptibility in a reversible and dynamic manner.

Antibiotic resistance occurs when medications for bacterial infections no longer work. Xiangmin Lin's research group at the Fujian Agriculture and Forestry University in China has worked on bacterial antibiotic resistance for many years, and their recent paper on the discovery of this novel mechanism was published in the journal **Molecular & Cellular Proteomics**.

More than 2.8 million antibiotic-resistant infections result in over 35,000 deaths each year in the U.S. alone, according to a Centers for Disease Control and Prevention report. If nothing changes, 10 million people will die from drug-resistant infections every year worldwide, surpassing deaths from cancer and diabetes, by 2050.

Lishan Zhang, a Ph.D. student in Lin's lab and first author of the MCP paper, said drug-resistant bacteria are found in settings ranging from hospitals to livestock breeding centers and aquaculture.

Fisheries around the world suffer enormous losses due to antibiotic-resistant bacterial pathogens such as A. hydrophila, which is fatal to freshwater fish.

Resistant bacteria can change an antibiotic's target, destroy or modify the drug, prevent its entry, or even pump it out of the cell. Several of these mechanisms are well documented, Zhang said, but few researchers have studied the role of protein lysine acetylation, or Kac, in antibiotic resistance.

Posttranslational modifications, or PTMs, are reversible enzymatic changes made in a protein after its synthesis. Kac modifications are a common type of PTM where an acetyl group can be reversibly added to or removed from lysine residues in a protein. In bacteria, quorum sensing, chemotaxis, metabolism and virulence pathways are known to use Kac modifications, but little was known about their role in antibiotic resistance before this study.

"We discovered a new and complex mechanism of bacterial drug resistance," Zhang said. "The most exciting aspect is that (Kac modifications) are reversible and dynamic, and bacteria can easily switch their 'on' or 'off' state to adapt to antibiotic stress instantaneously."

Using quantitative proteomics, Lin's group found that A. hydrophila that is resistant to the antibiotic oxytetracycline has less Aha1 — an outer membrane protein that belongs to the Gram-negative porin family. Three lysine residues located at the extracellular pore vestibule and their acetylation status regulate antibiotic uptake by changing Aha1's pore size. The Kac status and consequent pore size of Aha1 affects multidrug resistance to the tetracycline and beta-lactam classes of antibiotics.

STEFAN WALKOWSKI/WIKIMEDIA COMMONS

Aeromonas hydrophila colonies growing on the blood agar. Colonies shown with reflected light.

Most studies of antibiotic resistance focus on identifying the gene or the protein, Zhang said, but posttranslational modifications add another layer of complexity. The Lin group will continue their research to better understand how the acetylation state of Aha1 is regulated and use what they call "special Kac-sites" on Aha1 to develop better diagnostic and therapeutic tools in future.

"Attention should be paid to the effect of posttranslational modification on antibiotic resistance," Zhang said. "These modifications may be a new target for drug development."

DOI: 10.1016/j.mcpro.2022.100248

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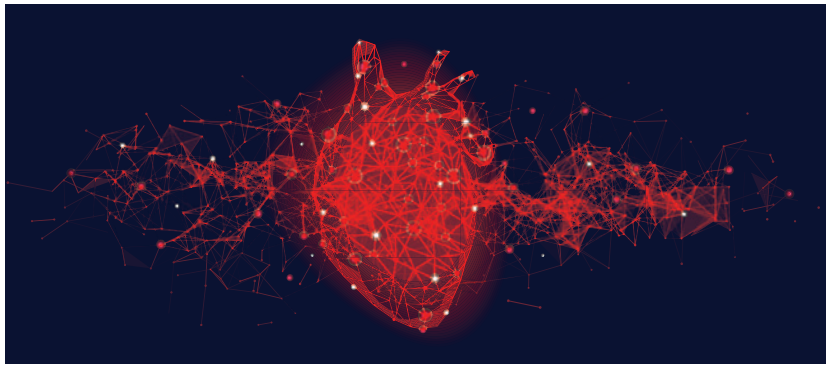
Lipoprotein(a): Silent killer or crystal ball?

By Aswathy N. Rai



Lipoproteins are made up of lipids and the proteins that transport lipids. Lipoproteins in the blood shuttle lipids such as cholesterol and triglycerides from the intestine to tissues throughout the body.

Lipoprotein (a), or Lp(a), consists of cholesterol and two proteins, Apo-B 100 and Apo(a). High levels of Lp(a) accelerate the buildup of cholesterol on artery walls, increasing a person's risk for acute coronary syndrome, or ACS, a blanket term for several diseases associated with sudden reduced blood flow to the heart. In the U.S., ACS affects 15.5 million people and is a leading cause of death.

Elena Aikawa's lab at Brigham and Women's Hospital in Boston focuses on studying the drivers of ACS and finding diagnostic biomarkers to identify populations at risk for cardiovascular diseases. In a collaborative study with Pawel Szulc's lab at the University of Lyon published in the **Journal of Lipid Research**, postdoc Francesca Bartoli–Leonard and a team of researchers assessed whether a relationship exists between high levels of Lp(a) and ACS in older men.

"With the American Heart Association estimating a person has a heart attack every 41 seconds, it's imperative we as scientists investigate how to predict these events in patients before they happen," Bartoli–Leonard said.

The Lp(a) levels in the blood are determined by variations in the LPA gene locus. Hence even individuals with healthy diet and exercise habits may be at high risk for ACS if they have genetic variants that produce high Lp(a) levels.

"Unfortunately, the guidelines from the American Heart Association only suggest clinicians measure lipoprotein(a) in individuals with hypercholesterolemia," Bartoli–Leonard said, "meaning there are large parts of the American population who may be at risk for lipoprotein(a)-driven cardiovascular disease who are simply unaware."

Doctors manage ACS with apheresis, a filtering process that removes Lp(a) particles from the blood. No drugs are approved for reducing Lp(a) levels; however, some therapies are currently in clinical trials.

"Clinical treatment for cardiovascular disease can be costly," Bartoli–Leonard said. "We wanted to find a marker that could be assessed once, and for a relatively low cost, that may help stratify which patients will have a coronary event."

To determine risk, the team tracked Lp(a) in 755 men over age 60 who live in the same community, following their coronary events and overall health for up to eight years. The researchers report that participants with blood Lp(a) levels higher than 50 milligrams per deciliter had an increased incidence of ACS.

The study was limited to white men living in France. "However, these results are consistent with reports that included more diverse ethnic backgrounds and those assigned female at birth," the authors wrote in the paper.

The study provides further evidence that Lp(a) levels predict the likelihood of a coronary event independent of common risk factors such as smoking, body mass index and cholesterol levels.

"We hope that our work, alongside with the other studies, which also look at Lp(a) in the general population, encourage the health care providers to assess Lp(a) routinely in the clinic," Bartoli–Leonard said.

DOI: 10.1016/j.jlr.2022.100242

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From the journals

By Ken Farabaugh, Nivedita Uday Hegdekar and Meric Ozturk

We offer summaries of recent papers in the **Journal of Biological Chemistry**, **Molecular & Cellular Proteomics** and **Journal of Lipid Research**.

An oxidative switch of chaperone activity

Oxidative stress can cause damage to proteins that promotes their misfolding and aggregation. The accumulation of these misfolded and aggregated proteins contributes to the pathogenesis of multiple neurodegenerative diseases, including Alzheimer's disease, Parkinson's disease and Huntington's disease. To prevent this aggregation, members of the ubiquitous protein chaperone family Hsp70 (such as yeast Ssa1) often can facilitate proper refolding of proteins.

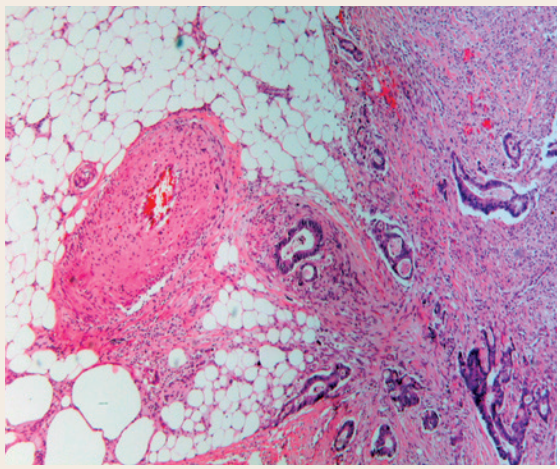
In a recent study published in the **Journal of Biological Chemistry**, Alec Santiago and Kevin Morano at the University of Texas Health Science Center at Houston showed that the reduced state of two cysteine residues, C264 and C303, in Ssa1 is important for the ability of this chaperone to maintain proteostasis in oxidative conditions. Using cysteine-to-alanine nullification and cysteine-to-aspartic acid oxidomimetic mutants, the authors demonstrated that these residues act as sensors of the environmental redox state; when oxidized, Ssa1 possessed diminished ATP binding, hydrolysis and protein folding capacity. In addition, mutated Ssa1 failed to bind and repress the main transcription factor of the heat shock response, Hsf1, leading to its constitutive activity.

Taken together, these findings

The glycome's role in a malignancy

Colorectal cancer, or CRC, is the leading cause of cancer death worldwide. The disease takes many forms and is difficult to diagnosis and treat. By identifying biomarkers, researchers hope to better understand CRC's progression and find effective therapies. One clue might be provided by the covalent attachment of complex sugar molecules such as glycans. Researchers have seen that altered glycosylation can be associated with colon cancer becoming malignant.

To investigate this further, Di Wang and researchers at Leiden University Medical Center in the Netherlands analyzed the glycosphingolipid, or GSL, glycans of 22 CRC cell lines using porous graphitized carbon nano–liquid chromatography coupled with electrospray ionization–mass spectrometry.



PATHOLOGY/WIKIMEDIA COMMONS

Altered glycosylation in cells could be associated with the malignant transformation in colon cancer.

The team found that GSL expression varies among different cell line classifications: Undifferentiated CRC cell lines were characterized by a high abundance of specific antigens that corresponded to the blood type of the person they were derived from. On the other hand, differentiated CRC cell lines contained prominent GSL glycans such as (sialyl)-LewisA/X and LewisB/Y antigens. By combining glycomics data with transcriptomic analysis, the researchers found a strong correlation between Lewis antigens in CRC cells and increased levels of glycosyltransferase FUT3 and numerous transcription factors, both of which influence colon differentiations. This could explain how GSL glycans can influence differentiation in conditions such as CRC.

This study, recently published in the journal **Molecular & Cellular Proteomics**, can serve as a resource for future research on biomarkers for CRC and pave the way for further studies.

DOI: 10.1016/j.mcpro.2022.100239

— Nivedita Uday Hegdekar

support a model by which two cysteine residues in an Hsp70 chaperone protein are subject to oxidative modification, which simultaneously negatively affects proteostasis and promotes a cytoprotective stress response pathway.
DOI: 10.1016/j.jbc.2022.102424

Reviewing sortilin's role in disease

Receptor-associated protein, or RAP, is a molecular chaperone that plays a role in folding and processing low-density lipoprotein, or LDL, receptors. Researchers have associated the glycoprotein sortilin, one of the binding partners of RAP, with Alzheimer's, prion and Parkinson's diseases and high cholesterol. Also, according to human genomewide association studies, the gene that encodes sortilin is associated with LDL cholesterol. However, researchers do not yet understand the mechanics of this association.

That association and the sortilin–RAP interaction suggest that sortilin may have a role in lipoprotein trafficking. Some studies have reported that sortilin regulates very low-density lipoprotein cholesterol secretion from hepatocytes, thus regulating LDL cholesterol levels. By extension, these findings suggest that sortilin affects cardiovascular and metabolic diseases.

Kelly Mitok, Mark Keller and Alan Attie at the University of Wisconsin–Madison have reviewed the literature, focusing on sortilin's sometimes confusing role in cardiovascular and metabolic diseases while outlining its structure, expression and regulation. Their review was published recently in the **Journal of Lipid Research**.
DOI: 10.1016/j.jlr.2022.100243

Why are two cancer drugs better than one?

Two of the most often dysregulated signaling pathways in cancer are PI3K-mammalian target of rapamycin and mitogen-activated protein kinase/ERK kinase/mitogen-activated protein kinase, known as MEK/MAPK, so researchers developed inhibitors of these pathways to treat specific cancer types. However, many of these inhibitors are ineffective because downstream pathways compensate for the drugs' anticancer activities, leading to drug resistance. This problem is being addressed by pairing synergistic therapies with both PI3K/

A combined strategy to fight cancer growth

Acetylated polyamines such as N8-actylspermidine, or N8-AcSpd, generally are considered excretory metabolites, as the additional positive charge facilitates membrane transport. Extracellular concentrations of N8-AcSpd can be particularly high in the intestinal lumen as a result of dietary intake and production by microbiota.

However, polyamines also can be taken up by cells and are known to support tumor growth in conditions where polyamines are limited, such as in certain cancers. Researchers have found that alpha-difluromethylornithine, or DFMO, an inhibitor of polyamine biosynthesis, can inhibit tumor cell growth, but compensatory uptake of polyamines like N8-AcSpd has limited its clinical success.

Recently, Tracy Murray Stewart and a team from John Hopkins University and Heidelberg University in Germany collaborated to investigate the role of histone deacetylase 10, or HDAC10, in this process. Cytosolic HDAC10 has been shown to have roles in various cellular processes, including autophagy and DNA repair; it specifically deacetylates N8-AcSpd, forming the polyamine spermidine.

The results of this work, published in the **Journal of Biological Chemistry**, showed that CRISPR-mediated deletion of HDAC10 prevented the rescue of DFMO-inhibited growth upon exogenous N8-AcSpd treatment. In addition, the authors describe an inexpensive, high-throughput assay that could be used to select potential HDAC10 small molecule inhibitors.

These results suggest that HDAC10 inhibitors, in combination with polyamine synthesis inhibitors such as DFMO, may represent an effective combination therapy for cancer treatment.
DOI: 10.1016/j.jbc.2022.102407

—Ken Farabaugh

AKT and MEK/MAPK inhibitors, but scientists have yet to understand fully why these combined treatments are more effective.

Maruan Hijazi and a team at Queen Mary University of London and the Alan Turing Institute used liquid chromatography-tandem mass spectrometry–based phosphoproteomics to learn why PI3K and MEK inhibitors work synergistically against cancer. Using cancer cell lines, they found that eukaryotic elongation factor 2 kinase, or eEF2K, a key convergence point downstream of MAPK and PI3K pathways, facilitated synergy during cotreatment with the drugs trametinib and pictilisib (which target specific MEK and PI3K kinases, respectively). Inhibitors of PI3K and MEK work together to inactivate eEF2K by phosphorylation and slowing its protein synthesis.

These studies, recently published in the journal **Molecular & Cellular Proteomics**, showed that eEF2K activity is a critical mediator of responses to PI3Ki plus MEKi and is a potential biomarker to predict whether combined treatment will be effective for certain cancers.
DOI: 10.1016/j.mcpro.2022.100240

Polymorphisms dictate prion pathogenesis

Transmissible spongiform encephalopathies, such as Creutzfeldt–Jakob syndrome, fatal familial insomnia and kuru are caused by propagation of misfolding of the human prion protein, or huPrP. The normal conformation, huPrPC, is characterized by numerous alpha helices, while the pathogenic conformation, huPrPSc, contains significantly more beta sheets. Methionine or valine polymorphisms at huPrP residue 129 are associated with the pathogenic phenotype and disease progression, although researchers do not yet understand the specific contributions of these residues.

In a recent study in the **Journal of Biological Chemistry**, Thomas Pauly and Najoua Bolakhrif of Heinrich-Heine-Universität Düsseldorf in Germany and a team of researchers used a number of techniques including amyloid formation kinetics assays, circular dichroism spectroscopy, molecular dynamics simulations and sedimentation velocity analysis to investigate the roles of M129 and V129 variants on overall huPrP structure. These authors found that the M129 variant displays less secondary structure and higher resistance to thermal denaturation than the V129 variant, as well as reduced distance between E196 and R156, allowing the formation of a salt bridge. Furthermore, deletion of the N-terminal half reduced the differences between these variants, highlighting the role of the flexible N-terminal domain in prion protein structure.

These results advance our knowledge of the pathogenic conformation of huPrP and provide insights into the pathomechanisms of prion diseases in general.
DOI: 10.1016/j.jbc.2022.102430

New mice help track PLD expression

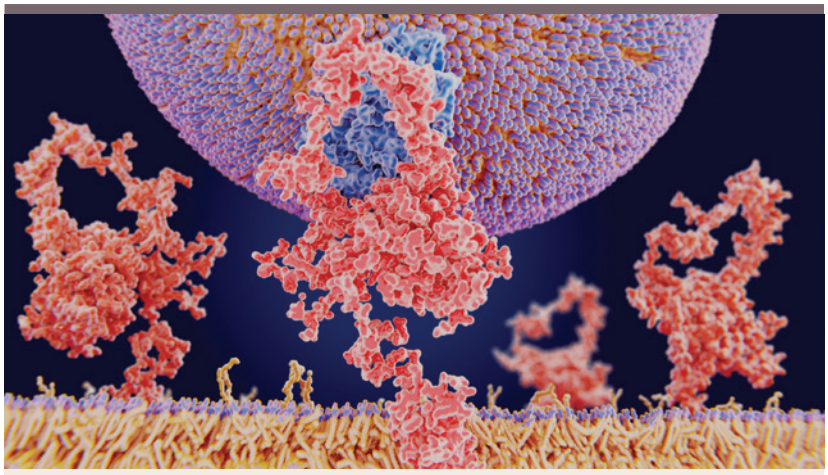
Phosphatidic acid, or PtdOH, is a phospholipid that plays a role in membrane fusion of secretory vesicle and granules. This negatively charged signaling molecule is recruited into microdomains, promotes membrane curvature and induces conformational changes in proteins. PtdOH interacts with proteins to regulate exocytosis in neuroendocrine cells and is involved in synaptic vesicle recycling in the mammalian central nervous system. It can be synthesized by phospholipase D, or PLD, mediated hydrolysis of certain phospholipids.

Researchers who study PLD activity often see conflicting results in the localization and expression of isoforms PLD1 and PLD2 because the reagents used in these experiments are unreliable. To address this problem, Casey Barber and a team at the Johns Hopkins University School of Medicine genetically altered mice to express labeled PLD1 and PLD2. Using brain slices and neuron cultures from these mice, the researchers investigated expression and localization of the isoforms.

Their results, published in the **Journal of Lipid Research**, showed that while PLD1 expression is predominant in neurons, PLD2 is expressed mostly in glial cells. The researchers also observed that overexpression of PLD1 reduces complexity of dendritic arborization and that PLD1 inhibition increases dendritic branching. Moreover, they found that PLD1 is expressed in the retina, although they do not know its role there. Overall, the group learned about the role of PLD in neurons and in glial and retina cells. And their genetically altered mice can be used for future studies of localization and expression of different tissues.
DOI: 10.1016/j.jlr.2022.100247

Where immunopeptidomics is going

In the 1970s, Baruj Benacarraf and Hugh McDevitt described the regulation of the immune response by the major histocompatibility complex, or MHC, a group of genes that code for proteins found on the surfaces of cells. The MHC locus is the most polymorphic region of the human genome and MHC molecules are able to present a wide distribution of antigen peptides to T cells, which discriminate self and nonself from many of these antigen peptides. Environmental stimuli and



The LDL receptor (red) is a membrane protein found in almost every human cell. It binds to the apoprotein B from LDL particles and mediates their internalization, or endocytosis, in the cell.

A molecule to recycle LDL

Low-density lipoprotein, or LDL, sometimes is known as bad cholesterol. An elevated level of circulating LDL increases risk of myocardial infraction and stroke. Thus, the body must be able to clear LDL.

The LDL receptor, or LDLR, molecule plays a major role in LDL clearance by binding to apolipoprotein B, a component of LDL, thus triggering intake, or endocytosis, of circulating LDL. The LDL then goes to a lysosome for hydrolysis, and the free LDLR is inserted back into the plasma membrane. This process is called recycling.

A number of proteins regulate LDLR expression and recycling. The small GTPase RAB10 is one of these, and RAB10 also is required for LDL uptake. Deleting RAB10 decreases endocytosis of LDL but increases accumulation of transferrin proteins, which play a role in iron metabolism in mammals.

Small GTPases cycle between inactive and active states. This molecular switching recruits effector proteins to membranes. Researchers have reported that RAB10 has a role in membrane trafficking in various cell types. And scientists know that RAB10 mediates insulin-stimulated transport of vesicles containing the glucose transporter GLUT4 to the plasma membrane.

Taslima Khan and a team at the University of Michigan recently investigated the role of RAB10 in LDLR and transferrin receptor, or TFR, recycling. Their study was published in the **Journal of Lipid Research**.

In this study, the group cited evidence that RAB10 promotes recycling of both LDLR and TFR: RAB10 depletion results in a decreased ratio of both receptors on the membrane without changing its expression and increased accumulation of both receptors in the cytoplasm, and RAB10 is colocalized with both receptors. The researchers suggest that RAB10 plays a broad role in trafficking, however, and thus targeting RAB10-mediated LDLR recycling is of limited therapeutic value.

DOI: 10.1016/j.jlr.2022.100248

—Meric Ozturk

proteolytic enzymes in distinct organelles shape these antigen peptides' biogenesis.

Isolation and characterization of these MHC-bound peptides, commonly using liquid chromatography and mass spectrometry, is called immunopeptidomics. In the journal **Molecular & Cellular Proteomics**, Pierre Thibault and Claude Perreault describe this evolving field and recent developments in workflows encompassing enrichment and labeling strategies, MS acquisition methods, sequencing and allele prediction software. They write that challenges with current methodologies include standardization and sensitivity of the techniques.

With advances in technology, immunopeptidomics provides new opportunities for basic and applied research. Such improvements benefit the field of immuno-oncology, where research can improve the efficacy of immunotherapies, including therapeutic vaccines and bispecific T-cell engagers.

DOI: 10.1016/j.mcpro.2022.100234

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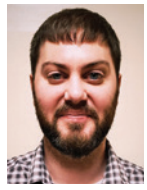

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The vital crosstalk between breath and brain

The rhythm of respiration influences a wide range of behaviors, as well as cognition and emotion. Neuroscientists are piecing together how it all works.

By Greg Miller

If you're lucky enough to live to 80, you'll take up to a billion breaths in the course of your life, inhaling and exhaling enough air to fill about 50 Goodyear blimps or more. We take about 20,000 breaths a day, sucking in oxygen to fuel our cells and tissues and ridding the body of carbon dioxide that builds up as a result of cellular metabolism. Breathing is so essential to life that people generally die within minutes if it stops.

It's a behavior so automatic that we tend to take it for granted. But breathing is a physiological marvel — both extremely reliable and incredibly flexible. Our breathing rate can change almost instantaneously in response to stress or arousal and even before an increase in physical activity. And breathing is so seamlessly coordinated with other behaviors like eating, talking, laughing and sighing that you may never have even noticed how your breathing changes to accommodate them. Breathing also can influence your state of mind, as evidenced by the controlled breathing practices of yoga and other ancient meditative traditions.

In recent years, researchers have begun to unravel some of the underlying neural mechanisms of breathing and its many influences on body and mind. In the late 1980s, neuroscientists identified a network of neurons in the brainstem that sets the rhythm for respiration. That discovery has been a springboard for investigations into how the brain integrates breathing with other behaviors. At the same time, researchers have been finding evidence that breathing may influence activity across wide swaths of the brain, including ones with important roles in emotion and cognition.

"Breathing has a lot of jobs," says Jack L. Feldman, a neuroscientist at the University of California, Los Angeles, and co-author of a recent article on the interplay of breathing and emotion in the Annual Review of Neuroscience. "It's very complicated because we're constantly changing our posture and our metabolism, and it has to be coordinated with all these other behaviors."

In the late 1980s, neuroscientists identified a network of neurons in the brainstem that sets the rhythm for respiration. That discovery has been a springboard for investigations into how the brain integrates breathing with other behaviors.

Each breath a symphony of lung, muscle, brain

Every time you inhale, your lungs fill with oxygen-rich air that then diffuses into your bloodstream to be distributed throughout your body. A typical pair of human lungs contains about 500 million tiny sacs called alveoli, the walls of which are where gases pass between the airway and bloodstream. The total surface area of this interface is about 750 square feet — a bit more than the square footage of a typical one-bedroom apartment in San Francisco and a bit less than that of a racquetball court.

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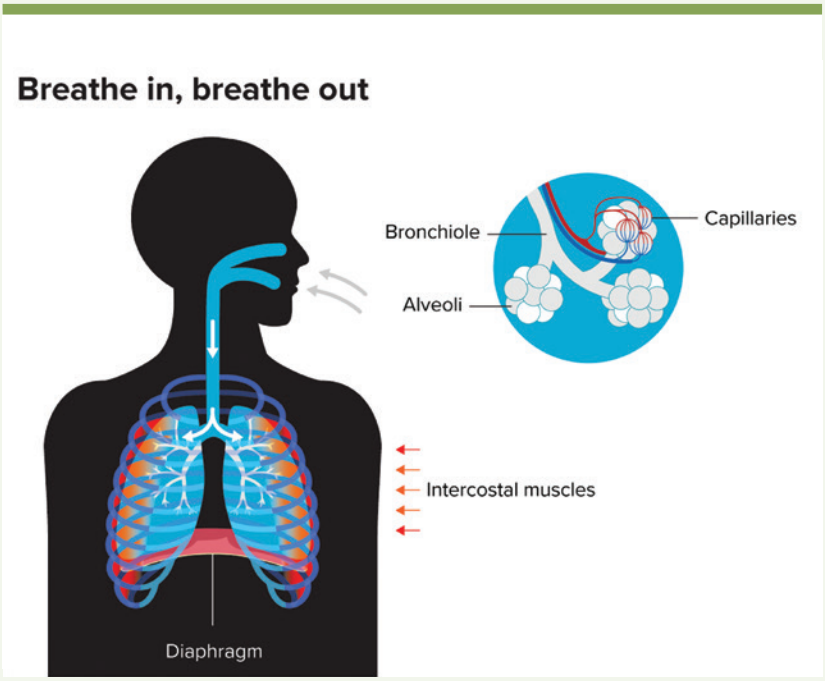


Breathing requires coordinated movements of the diaphragm and intercostal muscles. When these muscles contract, air is drawn into the lungs, where hundreds of millions of tiny alveoli provide a surface where oxygen can diffuse into the blood and carbon dioxide can diffuse out. With each exhalation, these muscles relax, and air is forced back out.

"The remarkable thing about mammals, including humans, is that we pack an enormous amount of surface area into our chests," says Feldman. More surface area means more gas is exchanged per second.

But the lungs can't do it alone. They're essentially limp sacks of tissue. "In order for this to work, the lungs have to be pumped like a bellows," Feldman says. And they are — with each inhalation, the diaphragm muscle at the bottom of the chest cavity contracts, moving downward about half an inch. At the same time, the intercostal muscles between the ribs move the rib cage up and out — all of which expands the lungs and draws in air. (If you've ever had the wind knocked out of you by a blow to the stomach, you know all about the diaphragm; and if you've eaten barbecued ribs, you have encountered intercostal muscles.)

At rest, these muscles contract only during inhalation. Exhalation occurs passively when the muscles relax and the lungs deflate. During exercise, different sets of muscles contract to force out air and speed up respiration.

Unlike the heart muscle, which has pacemaker cells that set its rhythm, the muscles that control breathing take their orders from the brain. Given the life-enabling importance of those brain signals, it took a surprisingly long time to track them down. One of the first to ponder their source was Galen, the Greek physician who noticed that gladiators whose necks were broken above a certain level were unable to breathe normally. Later experiments pointed to the brainstem, and in the 1930s, the British physiologist Edgar Adrian demonstrated that the dissected brainstem of a goldfish continues to produce rhythmic electrical activity, which he believed to be the pattern-generating signal underlying respiration.

But the exact location of the brainstem respiratory-pattern generator remained unknown until the late 1980s, when Feldman and colleagues narrowed it down to a network of about 3,000 neurons in the rodent brainstem (in humans it contains about 10,000 neurons). It's now called the pre-Bötzinger complex, or preBötC. Neurons there spontaneously exhibit rhythmic bursts of electrical activity that, relayed through intermediate neurons, direct the muscles that control breathing.

Over the years, some people have assumed Bötzinger must have been a famous anatomist, Feldman says, perhaps a German or Austrian. But in fact the name came to him in a flash during a dinner at a scientific conference where he suspected a colleague was inappropriately about to claim the discovery for himself. Feldman clinked his glass to propose a toast and suggested naming the brain region after the wine being served, which came from the area around Bötzingen, Germany. Perhaps lubricated by said wine, the others agreed, and the name stuck. "Scientists are just as weird as anyone else," Feldman says. "We have fun doing things like this."

Pinpointing breath's rhythm setters

Much of Feldman's subsequent research has focused on understanding exactly how neurons in the preBötC generate the breathing rhythm. This work also has laid a foundation for his lab and others to investigate how the brain orchestrates the interplay between breathing and other behaviors that require alterations in breathing.

Sighing is one interesting example.

A long, deep breath can express many things: sadness, relief, resignation, yearning, exhaustion. But we humans aren't the only ones who sigh — it's thought that all mammals do — and it may be because sighing has an important biological function in addition to its expressive qualities. Humans sigh every few minutes, and each sigh begins with an inhale that takes in about twice as much air as a normal breath. Scientists suspect this helps pop open collapsed alveoli, the tiny chambers in the lung where gas exchange occurs, much as blowing into a latex glove pops open the fingers. Several lines of evidence support this idea: Hospital ventilators programmed to incorporate periodic sighing, for example, have been shown to improve lung function and maintain patients' blood oxygen levels.

In a study published in 2016 in Nature, Feldman and colleagues identified four small populations of neurons that appear to be responsible for generating sighs in rodents. Two of these groups of neurons reside in a brainstem region near the preBötC, and they send signals to the other two groups, which reside inside the preBötC. When the researchers killed these preBötC neurons with a highly selective toxin, the rats ceased to sigh, but their breathing remained robust. On the other hand, when scientists injected neuropeptides that activate the neurons, the rats sighed 10 times more frequently. In essence, the researchers concluded, these four groups of neurons form a circuit that tells preBötC to interrupt its regular program of normal-sized breaths and order up a deeper breath.

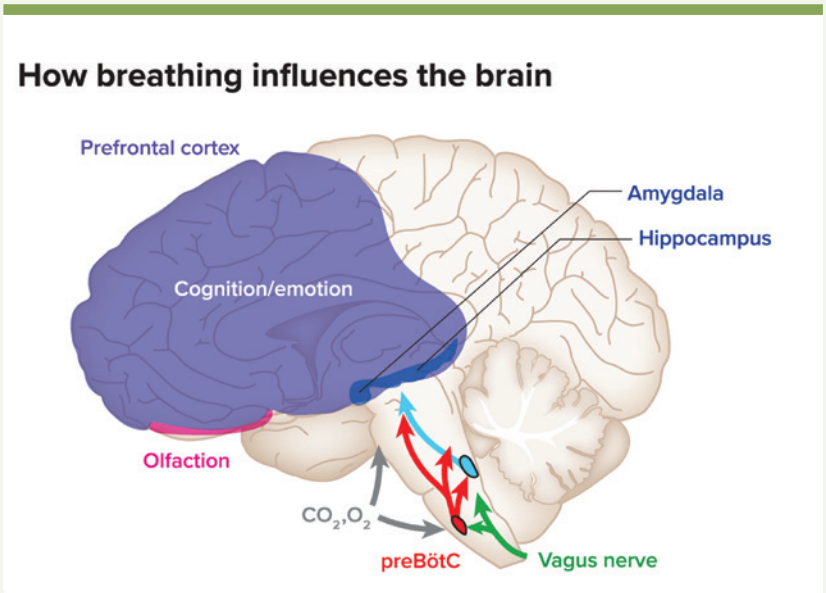
The preBötC also has a role in coordinating other behaviors with breathing. One of Feldman's collaborators on the sighing paper, neuroscientist Kevin Yackle, and colleagues recently used mice to investigate interactions between breathing and vocalizations. When separated from their nest, newborn mice make ultrasonic cries too high-pitched for humans to hear. There are typically several cries at regular intervals within a single breath, not unlike the syllables in human speech, says Yackle, who's now at the University of California, San Francisco. "You have this slower breathing rhythm and then nested within it you have this faster vocalization rhythm," he says.

To figure out how this works, the researchers worked their way backward from the larynx, the part of the throat involved in producing sound. They used anatomical tracers to identify the neurons that control the larynx and follow their connections back to a cluster of cells in the brainstem in an area they named the intermediate reticular oscillator, or iRO. Using a variety of techniques, the researchers found that killing or inhibiting iRO neurons removes the ability to vocalize a cry, and stimulating them increases the number of cries per breath.

When the researchers dissected out slices of brain tissue with iRO neurons, the cells kept firing in a regular pattern. "These neurons produce a rhythm that's exactly like the cries in the animal, where it's faster than but nested within the preBötC breathing rhythm," Yackle says.

Additional experiments suggested that iRO neurons help integrate vocalizations with breathing by telling the preBötC to make tiny inhalations that interrupt exhalation — enabling a series of brief cries to fit neatly within a single exhaled breath. That is, rhythmic crying isn't produced by a series of exhalations but rather by one long exhalation with several interruptions.

The findings, reported earlier this year in Neuron, may have implications for understanding human language. The number of syllables per



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Breathing appears to have far-reaching influences on the brain, including on regions with roles in cognition and emotion, such as the hippocampus, amygdala and prefrontal cortex. These effects may originate from signals generated by the brainstem breathing center, preBötC; from sensory inputs via the vagus nerve or olfactory system; or in response to levels of oxygen (O_2) and carbon dioxide (CO_2) in the blood.

second falls within a relatively narrow range across all human languages, Yackle says. Perhaps, he suggests, that's due to constraints imposed by the need to coordinate vocalizations with breathing.

Setting the pace in the brain

Recent studies have suggested that breathing can influence people's performance on a surprisingly wide range of lab tests. Where someone is in the cycle of inhalation and exhalation can influence abilities as diverse as detecting a faint touch and distinguishing three-dimensional objects. One study found that people tend to inhale just before a cognitive task — and that doing so tends to improve performance. Several have found that it is only breathing through the nose that has these effects; breathing through the mouth does not.

One emerging idea about how this might work focuses on well-documented rhythmic oscillations of electrical activity in the brain. These waves, often measured with electrodes on the scalp, capture the cumulative activity of thousands of neurons, and for decades some neuroscientists have argued that they reflect communication between far-flung brain regions that could underlie important aspects of cognition. They could be, for example, how the brain integrates sensory information processed separately in auditory and visual parts of the brain to produce what we experience as a seamless perception of a scene's sounds and sights. Some scientists even have proposed that such synchronized activity could be the basis of consciousness itself (needless to say, this has been hard to prove).

Growing evidence suggests breathing may set the pace for some of these oscillations. In experiments with rodents, several research teams have found that the breathing rhythm influences waves of activity in the hippocampus, a region critical for learning and memory. During wakefulness, the collective electrical activity of neurons in the hippocampus rises and falls at a consistent rate — typically between six and 10 times per second. This theta rhythm, as it's called, occurs in all animals that have been studied, including humans.

In a 2016 study, neuroscientist Adriano Tort at the Federal University of Rio Grande do Norte in Brazil and colleagues set out to study theta oscillations but noticed that their electrodes also were picking up another rhythm, a slower one with about three peaks per second, roughly the same as a resting mouse's respiration rate. At first they worried it was an artifact, Tort says, perhaps caused by an unstable electrode or the animal's movements. But additional experiments convinced them that not only was the rhythmic activity real and synched with respiration, but also that it acted like a metronome to set the pace for the faster theta oscillations in the hippocampus.

Around the same time, neuroscientist Christina Zelano and colleagues reported similar findings in humans. Using data from electrodes placed by surgeons on the brains of epilepsy patients to monitor their seizures, the researchers found that natural breathing synchronizes oscillations within several brain regions, including the hippocampus and the amygdala, an important player in emotional processing. This synchronizing effect diminished when the researchers asked subjects to breathe through their mouths, suggesting that sensory feedback from nasal airflow plays a key role.

Not only does the respiration rhythm synchronize activity in brain regions involved in emotion and memory, it can also affect people's performance on tasks involving emotion and memory, Zelano and colleagues found. In one experiment, they monitored subjects' respiration and asked them to identify the emotion expressed by people in a set of photos developed by psychologists to test emotion recognition. Subjects were quicker to identify fearful faces when the photo appeared as they were taking a breath compared to during exhalation. In a different test, subjects more accurately remembered whether they'd seen a photo

previously when it was presented as they inhaled. Again, the effects were strongest when subjects breathed through the nose.

More recent work suggests the respiratory rhythm could synchronize activity not just within but also between brain regions. In one study, neuroscientists Nikolaos Karalis and Anton Sirota found that the respiration rate synchronizes activity between the hippocampus and the prefrontal cortex in sleeping mice. This synchronization could play a role in making long-term memories, Karalis and Sirota suggest in a paper published earlier this year in Nature Communications. Many neuroscientists think memories initially form in the hippocampus before being transferred during sleep to the cortex for long-term storage — a process thought to require synchronized activity between the hippocampus and cortex.

For Tort, such findings suggest there may be important links between respiration and brain function, but he says more work is needed to connect the dots. The evidence that breathing influences brain oscillations is strong, he says. The challenge now is figuring out what that means for behavior, cognition and emotion.

Controlled breath, calm mind?

For millennia, practitioners of yoga and other ancient meditation traditions have practiced controlled breathing as a means of influencing their state of mind. In recent years, researchers have become increasingly interested in the biological mechanisms of these effects and how they might be applied to help people with anxiety and mood disorders.

One challenge has been separating the effects of breathing from other aspects of these practices, says Helen Lavretsky, a psychiatrist at UCLA. "It's really hard to distinguish what's most effective when you're doing this multicomponent intervention where there's stretching and movement and visualization and chanting," she says. Not to mention the cultural and spiritual components many people attach to the practice.

For many years, Lavretsky has collaborated with neuroscientists and others to investigate how different types of meditation affect the brain and biological markers of stress and immune function. She has found, among other things, that meditation can improve performance on lab tests of memory and alter brain connectivity in older people with mild cognitive impairment, a potential precursor to Alzheimer's disease and other types of dementia. In more recent studies, which have yet to be published, she's moved toward investigating whether the breath control methods alone can help.

"Even though I'm a psychiatrist, my research is on how to avoid (prescribing) drugs," says Lavretsky, who is also a certified yoga instructor. She thinks breathing exercises might be a good alternative for many people, especially with more research on which breathing techniques work best for which conditions and how they might be tailored to individuals. "We all have this tool, we just have to learn how to use it," she says.

The evidence that breathing influences brain oscillations is strong, Adriano Tort says. The challenge now is figuring out what that means for behavior, cognition and emotion.

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Greg Miller is a science journalist based in Portland, Oregon. Read more of his work at www.gregmiller.co.

On the intersectionality of race and mental health

In this Q&A, campus psychologist Batsirai Bvunzawabaya talks about students' concerns and experiences — and the importance of demystifying therapy.

By Ann Thomas

Batsirai Bvunzawabaya is the director of outreach and prevention at the University of Pennsylvania and one of the university's mental health consultants for the Steve Fund, which focuses on supporting the mental health and emotional well-being of young people of color.

For Batsirai Bvunzawabaya, several family experiences led her toward a career in psychology. When Bvunzawabaya was a teen in her native Zimbabwe, her older sister studied social work and pushed her to think about pursuing a helping field. She credits her older sister with sparking her interest in counseling others as a profession.

But it was the death of her father from cancer when she was 16 that truly set Bvunzawabaya on the path to becoming a psychologist.

"I think, in some ways, that was a big sort of impetus to thinking about being in a helping role. I had such a great and supportive family," Bvunzawabaya said, "but I also just didn't want to burden them with my own thoughts and feelings about how I was impacted by my dad's death because I knew they were obviously impacted as well. … And yet I still felt like it would be nice to sort of just talk to somebody else about how I feel."

Shortly before her 18th birthday, Bvunzawabaya moved to the United States, where she was able to land a tennis scholarship at Alabama A&M University, a historically black institution. She majored in psychology.

She then earned a doctoral degree from Auburn University in counseling psychology, which she describes as "probably one of the best life decisions I could have ever made."

She finds it rewarding to focus on strengths and to think about not just the struggles people have had but also "the amazing ways that human beings can continue to evolve and change and persevere through a lot of difficult life challenges."

While finishing her doctorate, she did an internship at the University of Pennsylvania's Counseling and Psychological Services, now known as Student Health and Counseling. She became a postdoctoral fellow in 2012 and then a staff psychologist. In 2019, she was made the associate director for outreach and prevention, and today she is director. She also very proudly serves as one of their mental health consultants for the Steve Fund, the nation's leading organization focused on supporting the mental health and emotional well-being of young people of color. In her role, she supports the organization by helping them to accomplish their goals: developing a robust national dialogue, adoption of effective programs by colleges and universities, greater knowledge and utilization of campus mental health services, and increased competency of families and mental health organizations serving their demographic.

Bvunzawabaya talked to ASBMB Today about her own experiences providing mental health care to students and the intersectionality of race and mental health. This interview has been edited for clarity and length.

Q: The Healthy Minds Study, which looked at trends in mental health diagnoses in college students between 2013 and 2021, found a 50% increase in mental health problems in college students. Does that match what you are seeing on your campus?

I think it does. Those numbers were steadily increasing before the pandemic. And then during the pandemic, we saw a slight decrease in students seeking help, but there were many reasons for that. Some students needed to care for a loved one, or they were living at home where it's harder for them make sure that they're engaging in therapy in a consistent way. Or maybe there is no privacy to engage in therapy at home. For example, some of our students may not be out (as LGBTQ) to their families, so for them to engage in therapy while at home may not have been something they could do.

But now that we're moving closer and closer to having some distance from the pandemic, we are continuing to see that students are in distress for a lot of different reasons and experiencing depression, anxiety and all of the things that the Healthy Minds Study highlighted.

Q: Do you have a sense of what is driving these increases?

Well, I think it's a lot of different things. So one is, you know, is it really an increase or are we getting better at encouraging people to seek help? Has there been good stigma-reduction work being done? Are people hearing certain celebrities or people within their community say, "Hey, I seek mental health care"?

And then there's another piece, which is the change in the way that we get news and the impact of social media — students are exposed to so much more information. So you can wake up this morning and hear about the folks in Indonesia who were in a stampede and hear what's happening with the floods (caused by the hurricane) in Florida. And then you're also getting local news for things that are happening within your community.

You're getting bombarded with so much information, and that is something that's a little bit different in terms of just how much is out there and how much of it can be distressing. In conversations we end up having with students, our message is, "You need to regulate your use of social media and how you get the news," because that could also be increasing a sense of distress.

The other thing that we're hearing more and more students talk about is just the concern around climate change and anxiety. A lot of students talk about the impact that has on their mental health and well-being. Sometimes I'll hear students say,

In conversations we end up having with students, our message is, "You need to regulate your use of social media and how you get the news," because that could also be increasing a sense of distress.

Batsirai Bvunzawabaya, left, speaks during a session on race and mental health at the 2022 ASBMB annual meeting in Philadelphia. Also on the panel were Cirleen DeBlaere (center), associate professor and coordinator of the counseling psychology doctoral program at Georgia State University, and Carlota Ocampo (right), provost, vice president of academic affairs and associate professor of psychology at Trinity Washington University.

"How can I focus on my classes when we're ignoring this bigger issue that may actually impact me in the future?"

And then, of course, there is the pressure that comes with being students and some of the day-to-day grind of that. Some of our students maybe feel a lot of financial stress, really feeling the pressure to turn this degree into something that will be lucrative that will support them or contribute to their family's financial stability. And for some of our students of color or students who have minoritized identities, they may face daily discrimination and microaggressions that are also adding to that stress.

But the point is there are so many different factors and it's hard for us to isolate and say, "Oh, it's just this one thing."

Q: One of the other striking findings of the Healthy Minds Study is that students of color were less likely to seek treatment. Can you talk about that a little bit?

I think some of it comes from the potential messages from family and friends around what it means to seek help. And how we define what strength is and what it isn't. I think sometimes there could be the pressure — that being vulnerable or being open with someone who's not in your family and who's not in your community — that maybe that person won't understand how you feel.

I think the other piece of it too is it can just be hard to be vulnerable. Especially when maybe you have experiences of discrimination and marginalization on a day-to-day basis. You can almost feel like, "OK, I just need to focus on what's in front of me. And just keep moving forward."

And then I also think that, as a psychologist, there's so much about what happens in therapy that can feel secretive because of the need for confidentiality and those things that provide a lot of safety. But I think for communities that may not have grown up hearing about therapy or knowing about therapy, it can just feel like it's too mysterious — like you don't know what you're signing up for.

You don't know what that person is going to ask you. Is your family going to get criticized, or are you going to be judged? There's so much for us, as a field, to do to make sure that students of color understand that this can be a helpful resource. We have to give them enough information to make that decision so that they know what they're getting into.

Lastly, I'll just say that access is an issue. Some students have difficulty with getting the care that they need, whether that's because they don't have the health insurance or there are other barriers. For students of color, sometimes seeing a therapist of color can also help in reducing stigma or concerns. But as we know, the number of therapists of color is small. And especially in smaller communities, they tend to be taxed because there's not that many of them. So that can be a barrier as well.

Q: Do you find any particular impact on students of color in STEM fields, where they're often underrepresented?

Yes, absolutely. I think the fact that they are underrepresented adds a layer of pressure. And I think, to some degree, it's difficult for some students not having enough mentorship, because there are so few available, that they may not be able to see what it means to not only progress through their program successfully but to do that while also having mental health challenges.

Do they end up seeing only people who seem the perfect or the polished ones who have everything together? Or are they able to find mentors who say, "Hey, these are the ways I've struggled. And these are the ways that I figured out how to care for myself."

And I think, depending on what their area is within the STEM fields, there are certain thoughts that we have about folks in STEM. You know — very confident, highly talented, driven. And I think some of those things, obviously, are extremely true, but in a lot of ways, how do you also think about how vulnerability is a part of that? For example, if you are thinking about being a physician who cares for other people, what does it mean to care for yourself and what does it take to make sure you realize that you being well is an important piece of your success as a physician?

I also hear from students of color within STEM fields that sometimes even when people are well meaning and trying to be supportive, there can be a sense of feeling isolated. Maybe folks in their families may not have gone through this experience that they're going through. It can be harder to form a sense of community within the field because, again, maybe there are fewer people who they can connect with or relate to in the ways that they need.

And then, of course, even when people are well meaning, sometimes there can be microaggressions and other forms of discrimination. Impostor feelings and things like

that can impact students' sense of belonging and sense of feeling validated within that environment.

Q: Do you feel that anti-racism training on campus for faculty and students can make a difference?

I do think it can make a difference. I think the trainings are helpful, but they need to be an ongoing discussion. It's all of our responsibilities, right? So even when you hire somebody that has a focus on diversity, equity and inclusion, it's not just like their thing that they're working on. It has to be something that we all understand is important. We can all make mistakes, but how do you address it? How do you recover from it? And how do you make sure that the person is not burdened with having to fix your mistake?

It's about taking accountability and recognizing that it's more about the culture change rather than seeing it as, "Oh, I took this one training, and that's it." It needs to be, "Oh, I took the training. And then I continued reading, and I went to this conference, and I had this conversation." You need to see it as the stepping stones to continuing to be more inclusive and creating a more inclusive environment.

Q: Do you have anything to add about how you try to address stigma and the intersectionality between mental health and race in your work?

As a therapist, I talk very openly with my students about it — not just for my students of color but as a therapist who is Black and African. I try to make sure that there's no part of therapy that feels like a mystery to them, even though there's already an inherent power differential, that therapy is collaborative. But I want students to have a sense of autonomy and ensure that they don't feel that it's something being done to them.

And we're both going to decide what's going to happen next in terms of treatment. So even when I see students who are having thoughts of suicide, it's trying to just talk to them and say, "OK, these are the options of things that we can do to keep you safe. What do you think works best for you?"

In some cases, I may have to say, "You know what, I don't know if that's actually going to work for you. How about we do this, right?" I try to make it seem as though it's a process we're engaged in together as opposed to a punitive process — such that because they told me this thing, now I have to send them to the hospital. It's more about, "How do we keep you safe? And you let me know how to do that. Together."

Part of what we want to do is have a trauma-informed approach and make sure that we're engaging students in a way that is safe and supportive. Hopefully, therapy will be a positive experience and they'll want to do this again in the future.

This is the first in a series of interviews with panelists for a session on race and mental health that was held at the 2022 ASBMB annual meeting in Philadelphia.

Ann Thomas (annthomas@fastmail.fm) is a freelance writer based in Portland, Oregon. A pediatrician turned disease detective, she writes about health, fitness and the environment.

Many undergraduates are depressed. Online instructors can help.

By Annie Prud'homme–Généreux

"We can look out into our classroom and think that everyone is having a perfectly fine day, but it's absolutely not true."

Katelyn Cooper said this, and she would know. Cooper leads the Cooper Biology Education Research Lab at Arizona State University. Her team recently conducted a survey of 2,175 undergraduates who were taking online science classes. The results, published in PLOS ONE in June, showed that a staggering 54% of the students reported experiencing symptoms of depression.

Cooper acknowledges that we live in uncertain times when pandemic lockdowns and social tensions likely increased this figure. But she said she wondered whether aspects of the classroom also impact mental health. Specifically, she wondered about the interplay between depression and online learning.

"The online format of learning lends itself to lots of different opportunities for students to feel hopeless," Cooper said, "and hopelessness leads to depression."

She and her team set out to investigate how depression affects a student's ability to learn online, and conversely, how the online learning environment impacts mental health.

It is a timely question, given that, before the pandemic, more than half of college students took at least one online course — and after many months of closed campuses and mandated distance learning, that number is likely higher now.

To investigate this, doctoral student Tasneem Mohammed interviewed 24 science students who identified as suffering from depression and who were completing their degrees online.

"The interviews gave me insight into how difficult managing college can be while going through a depressive episode," Mohammed said.

Students appreciated the opportunity to talk.

"We asked participants what type of gift card they would like" for participating in the study, Cooper said, "and they were like, 'oh, there is a gift card? I was just excited that you wanted to talk to me about my experience.'"

Small steps can help

Digging into what helps and hinders depressive symptoms for students in an online course, Mohammed found that seemingly small aspects of communication from instructors can have big impacts.

For example, if a student who is experiencing depression asks a question and an instructor doesn't answer in a timely fashion (or at all), "the student can internalize that and blame themselves," Cooper said.

One study participant described that experience as "crushing, because

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it feels like once again you weren't good enough to get your questions answered or were too stupid and you didn't ask the right questions."

Of course, the instructor might counter that they had no ill intent, explaining, "An email accidentally got deleted or went to the bottom of my inbox and I didn't see that discussion post," Cooper said. But, she added, "Students with depression often blame themselves when things don't go as planned."

Knowing this, instructors can be more mindful about providing timely answers, using a variety of channels such as emails, discussion forums and social media.

The good news is that such small steps make a difference. "If I'm starting to spiral, if I'm starting to go into a negative thought pattern and I post something and almost immediately get a response, then it's a hard shock," another study participant said. "I'm like, 'Oh, okay. I have a solution. I can figure it out.'"

Seen and not seen

In her article published in CBE–Life Sciences Education, Mohammed reported how a wide range of online classroom practices can affect depression. Students told her they appreciate being able to turn their cameras off during a synchronous session.

"It's comforting that I can have a bad day and that I can show up with my hair not brushed and be crying and have makeup down my face and no one can see me," one student said.

After seeing these responses, Cooper changed her online course policy and gave students the option. "Everybody turned their cameras off," she said.

She was initially dismayed but reconsidered. "We often think that students learn better with their cameras on," she said, "but I think we should challenge that."

Cooper realized that she liked students to have their cameras on not for their learning but for her own sake, she said. "I'm a better teacher when I can see my students."

She now encourages instructors to be honest about why they require students to have their cameras on and to give students options.

Who has symptoms?

The two papers published by this group — the in-depth interviews with 24 students who identify as suffering from depression and the quantitative survey of 2,175 online students — paint a picture of the experience of today's online science students and what can be done to support their mental health.

What's more, the team's studies show that students who traditionally have been underrepresented and underserved in science — students who are women or LGBTQ+ and those who experience financial instability — are more likely to have depressive symptoms, and those symptoms are more severe.

That's important. "We know that more diverse groups of researchers lead to better science," Cooper said.

This data provides another incentive for educators to create online learning environments that support students with depression.

"If a student comes out and identifies as having depression to an instructor," Mohammed said, "that's itself a big step."

Annie Prud'homme-Généreux (anniepg@gmail.com) is a freelance writer who lives in beautiful Vancouver, Canada.

Five tips for online instructors

Tasneem Mohammed encourages instructors to make small changes that can make a big difference. Her two articles coming out of the Cooper Lab are chockful of concrete advice including these five tips:

1. Show that you care about mental health. Provide resources in your syllabus and acknowledge the impact of mental health in an early course announcement.
2. Permit anonymity. Do not require that cameras be turned on during synchronous sessions.
3. To break the isolation, design activities for student interactions such as breakout rooms, small group projects and discussion board posts.
4. Respond to students quickly and allow students to ask questions through multiple outlets such as email, discussion boards and social media.
5. Provide multiple deadlines throughout the course rather than a single deadline at the end of the semester.

Breathing and not breathing

How I got hooked on hypopressive and low pressure fitness techniques

By Danielle Guarracino

"Exhale, hold your breath, and apnea,* open your rib cage, lift your rib cage out of your pelvis …"

This may sound a bit like medieval torture, but it's commonplace cuing for what's known as low pressure fitness, or LPF, with hypopressive breathing techniques, a form of exercise and wellness that focuses on the core and posture. Hypopressive means decreasing the pressure in your thoracic, abdominal and pelvic regions by controlled holding and release of breath.

I first practiced LPF as part of a hospital-sponsored postpartum exercise class a few months after I gave birth to my daughter. I often fall prey to fitness and exercise fads that never seem to stick, but this seemed like a fun way to get out of the house — and exercising with my baby rolling around on the mat below gave me a thrill. It was a terrific class; the babies were ridiculously cute, testing out smiles, rolls and vocalizations as we stretched, bent and posed above them.

What I most loved, however, was the class's emphasis. It was not at all about the seemingly unobtainable goal of quickly regaining my prepregnancy body. Instead, the physical therapists who taught the class focused on pelvic floor stability, mobility and health. Low pressure fitness and the cycles of hypopressive breathing were just part of the course, but they were what hooked me.

All my life, I've suffered from abdominal cramping, endometriosis and gastrointestinal issues, so I was happy to find a way to control breath and release my abdomen. The hypopressive lift and expansion reduce pressure, the opposite of exercises like situps and crunches that put strain and pressure on the abdomen and pelvis. I had found my niche.

How does it work?

While engaging your posture — sitting up straight — take a big breath in and then slowly release all the air in your lungs. When you feel like a completely deflated balloon, hold your breath and imagine now that you're taking a "fake breath" — open your rib cage and go through the abdominal motions of breathing without actually inhaling.

This technique, which allows the diaphragm and rib cage to expand, lifting the pelvic floor with it, is not new. According to the teaching site Elevate Core Health, which is led by my postpartum teacher and pelvic health physical therapist, Becky Keller, hypopressive breath training has been around for hundreds of years in conjunction with yoga practices. Body builders such as Arnold Schwarzeneggar have been known to use hypopressives to enhance their poses as they strut their physiques. Low pressure fitness began as a whole-body workout and posture system combining the breath training with often challenging poses and stretches.

Two years after that postpartum class, in the summer of 2021, Becky sent an email announcing that she was offering Zoom-based virtual classes and workshops on low pressure fitness. I decided to jump back in from the comfort of my own home. It was difficult. I hadn't thought about these techniques, let alone practiced them, since 2019. My arms, back and legs ached a bit afterward.

These moves don't necessarily raise your heart rate, but the constant apnea cycles combined with total body engagement are definitely an exercise you feel. While the top of your head "grows toward the ceiling" and the shoulder girdle spreads, stretching down your legs to your feet, often standing with a slight lean to activate your core muscles further, you are involving your whole body. Sometimes we use a TheraBand or yoga brick for tension or balance, respectively.

It was hard, but I was a convert. I immediately bought a pack of five online classes to continue my practice. Now, a year and a half later, almost every Sunday I wake up and join Becky's class for virtual exercise.

Why continue remotely? Becky has opened in-person classes again, and not too far away from my house, but the accessibility of being able to do this at home is key. My motivation to continue practicing has increased because I have the convenience of performing something so complicated very simply in my home. My daughter can sleep in

the other room, my husband can go to church and my dog can wander around (putting a smile on my classmates' faces) as I exercise. I even can go outside on a nice day and set up my computer on the deck. For me, doing something this empowering and fine-tuned while out in nature is an extra perk.

How effective is virtual exercise? With low pressure fitness, as long as your camera captures your full body, it's remarkable how much the teacher can see. Becky accurately cues, corrects and praises us in small classes of about four students. Low pressure fitness has several ability levels. After being active for the past year and a half, I've progressed from beginner to intermediate with my weekly class and two workshops (for deeper focus and skill), graduating from hypopressive breathing accompanying rigid poses into more flow from pose to pose, including asymmetry and dynamic movement. For example, one arm may be up, the other down, and then one leg lunges forward and the hands come to another position or spiral the fingers, opening a fist and engaging the radial nerves through the hands, all while practicing hypopressive breathing.

How do I incorporate this practice into daily life? At the intermediate level, the full sequence of 12 poses, done on both sides for balance (right leg forward and then repeated with left leg forward), takes about 11 minutes if no major variations are added. While Becky's weekly classes last roughly an hour, including a full warmup and a postexercise mindfulness activity, my daily (or whenever I can fit it in) practice can be much shorter, just hitting the major groups and poses.

What's the coolest part of LPF?

The poses are named after goddesses. Drawing from Greek, Roman, Norse and Egyptian mythology, the colorful names and body positioning often clearly illustrate their symbolism (a warrior, justice, fertility). One subset of LPF uses a wall for posture, and each of those poses takes on the equivalent names of mythological gods. Empowering? Check! I feel a delightful gravitas knowing what "doing a Persephone with a low Athena arm" means — and performing it — channeling these powerful, mythical women.

What benefits can I attest to? I'm not always consistent in my practice, but I do love a challenge. While my core still could use some work, my posture and my minor pelvic floor dysfunction both have improved. And the hypopressive breath training has benefitted me in ways I didn't anticipate. I recently took up running again — nothing too drastic, too far or too fast — and when I added miles, I found that my body was a bit fatigued but I was not out of breath. This was true every time I ran, even on the hottest of days.

LPF brings me the promise of the goddess, the challenge of the core and an indescribable euphoria that floods my system when I regain breath after holding it with moving, posing and stretching. Such oddly satisfying moments are rare in life, and as I continue my own wellness journey, LPF is here to stay as my method of choice.

** Suspend your breath.*

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Follow the oxygen mask rule

By Jeanine Amacher

THE RULE: If an airplane cabin loses pressure, oxygen masks will fall from the ceiling. You need to place your mask on yourself before trying to help others.

I became a parent during the final year of my postdoc at Berkeley. Very quickly, I realized that if I did not take care of myself, I was not going to be able to care for my newborn son effectively. The oxygen mask rule is my No. 1 parenting doctrine, and I use it to this day, now with two boys who are 3 and 6: Put on your own oxygen mask first.

For lack of a less vivid metaphor — if the cabin pressure drops, I'm not going to be any help to those around me if I pass out from lack of oxygen.

As an associate professor of biochemistry in a two-career household with young kids, I've found that this philosophy serves me well in many facets of life. I can shower daily, even with a baby in the house. I can find 30 minutes to be outside and/or exercise. I can eat regularly, brush my teeth and generally take care of myself. I may not be sleeping much, but that's what coffee is for. (Kidding.)

Even if my experiments take an extra couple of days, I am less likely to make careless mistakes from lack of cognitive endurance. I will burn out if I don't identify and prioritize the aspects of well-being that are important for me.

Reflecting on how I have stayed healthy and balanced in 2022, I realize that I actually adopted the oxygen mask rule professionally long before I began having kids.

Once upon a time, I was an undergraduate physics major and pre-med student. I wasn't particularly excited about being a physician, but as an 18-year-old who loved science, I didn't know what else there was to do — something I often see in the undergraduates I teach today. However, early in my junior year, the cracks began to appear.

Exposure to the medical field — for example, experiences shadowing a neurologist and volunteering in the children's hospital — inevitably brought up hard conversations about mortality, something the atheist in me has always struggled with. At the same time, I was learning about the infinite universe and its laws in my physics courses. I would close my eyes at night and see the vastness of space, feeling small and inconsequential.

COURTESY OF JEANINE AMACHER

Members of the Amacher Lab, October 2022.

After taking a couple of exams on exactly zero sleep, I knew I had to address my mental health to be productive. I was spending my best hours doing biophysics research on bacteriorhodopsin, not shadowing physicians, so I left behind my M.D. goals and shifted to excitement about a Ph.D.

And I began to make other changes. I realized that I had to study outside of my apartment, creating space between school and home. And to sleep, I needed to exercise daily, stay hydrated and study no later than 6 p.m. Now, more than 15 years later, I still carry a water bottle with me everywhere, and I'm rarely seen wearing anything other than athletic clothes, except when I am teaching. I've gone on 27-minute runs before department meetings, where I then sit in the far back corner to create space between my sweat and my colleagues.

I learned to be realistic with myself about what I wanted my life to look like. Early in my postdoc, I realized that while I could work to compete for academic positions at R1 institutions, I was unlikely to find joy in that path. I decided to focus on a career at a primarily undergraduate institution, which combined my interests in teaching, research and mentorship at a level I was excited about.

I fell in love with spinning classes when I was an undergraduate and became a certified instructor during graduate school. I'm writing this essay still glistening from teaching my weekly faculty/staff spinning class.

When I was working toward my graduate degree, a fellow Ph.D. student vocally resisted joining the graduate committee as a student member, saying it would be a waste of time and take away from their research. I'm thankful I followed my gut to join that committee and others. Professional service is now a large component of my reviews. My years of professional development and leadership training have absolutely aided me several times in my personal career trajectory, despite all that time away from the bench.

So here's my advice for following the oxygen mask rule:

- Maintain productivity by establishing short- and long-term goals, and schedule your life so they are feasible.
- Be realistic about what you can reasonably accomplish.
- If you are a student or postdoc, take time for yourself and the things that bring you joy. You will be happier and get more done.
- Follow your gut; you know yourself best.
- Go on your daily runs, spend time with loved ones and sleep.

Yes, these things take time, and we are limited to 24 hours in a day. But you will achieve far less if you are unconscious on the airplane floor.

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COURTESY OF JEANINE AMACHER

Jeanine Amacher and her family at the finish line of a recent 5K race, one day after her older son turned 6.

Why I shrank my lab by half

By Anne E. Carpenter

I recognized that it was completely irrational to run my own health into the ground doing biomedical research to improve other people's well-being.

Six months into 2020, I began having joint pain. It was mild, but I knew I should seek help just in case I was experiencing the first pangs of a serious disease. As physicians proposed potential diagnoses, I was suddenly confronted with the possibility that I might soon become unable to type or walk. My mind began swimming with thoughts about what this could imply for my future, and for my career.

My doctor finally settled on a likely diagnosis of psoriatic arthritis. No treatment was available unless the symptoms became significantly worse, but he said that one thing might help: reducing stress. I laughed at the suggestion. What a thing to say, during a pandemic, to a mother of five leading a 20-person research group! Still, I recognized that it was completely irrational to run my own health into the ground doing biomedical research to improve other people's well-being. I knew that something had to change, but none of the obvious options were appealing.

Quitting entirely was an excruciating thought. I have been running a lab at the Broad Institute for over a decade, and I had just started to co-lead the National Institutes of Health–funded Center for Open Bioimage Analysis. As one of the rare women in a computational field, I felt an obligation to stay. Above all, I find great joy in science. After years of feeling like I was keeping my head just barely above water, I was finally hitting my stride.

I considered reducing my hours, but I'd always been adamant about limiting my time in the lab. Even as a principal investigator, I typically put in 45 to 50 hours a week, apart from major deadlines. These boundaries already put pressure on my workday: Reducing my hours without decreasing my workload would only create more stress.

Left with few options, I started thinking about scaling back my lab and reducing the number of scientists I employ and train. With fewer people to fund, I could cut down on the number of grant proposals and progress reports I had to write. It would also reduce how many projects I need to design and oversee to publication.

Still, most labs at my institution were already bigger than mine: If my lab became smaller, would people assume that I had grown complacent midcareer or that I couldn't get grants? Would downsizing impact the quality and breadth of my research? And would a smaller lab survive inevitable fluctuations in funding? I spent six months thinking through options and discussing them with my leadership, which luckily was supportive and never showed a hint of disappointment. In the end, I decided to shrink my lab by half.

A former staff scientist, Beth Cimini, was just launching her own group: I transferred a major grant and half my personnel to her, as she had been instrumental in designing

the research and mentoring lab members. With this move, I will no longer work on the research that resulted in us creating CellProfiler, a tool that thousands of biologists now use to measure and analyze cell images; instead, I am dedicating myself to Cell Painting, a narrower but growing technology that has already yielded several clinical drug candidates.

In addition, I formally named a long-time staff scientist, Shantanu Singh, as co-leader of my now smaller group; we are now officially the Carpenter–Singh lab! To me, this was an important step to recognize the leadership he had already been providing. We received so much support when we announced this decision on Twitter, with many wishing that more institutions would encourage the concept of a shared lab. There is no denying that it is an effective way to do science, especially at the interface of two fields like computational biology. And research is simply more fun with a senior colleague.

It now has been a year since the downsize. The workload has taken a while to slow down, as papers from my former group still are being revised and published, but I'm starting to see signs of this new career phase. I've begun to catch up on reading literature, and I'm generally just less harried from day to day with deadlines. I've had to be careful to avoid filling in more work the moment there's a bit of breathing room — a common pitfall for many academics — but for the first time since I launched my lab 15 years ago, I plan to use my full vacation time this year. Scientifically, the outcomes have been more positive than I could have imagined: It's been incredibly satisfying to see Beth owning and growing her independent research vision and to share the credit for the work of the new Carpenter–Singh lab with Shantanu officially. Best of all, I've yet to experience a relapse of symptoms.

The world of science involves a lot of comparison, and the size of one's lab often is used as a marker of success. I hope that even in the absence of a medical crisis, others will have the confidence and support to re-evaluate how to reduce stress in their environment and measure scientific success in a more meaningful and personal way.

This article originally was published in eLife as a Sparks of Change column.

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Another hill to climb

Stress, anxiety and self-care while being Black in the ivory tower

By Kayunta Johnson–Winters

Being a faculty member at a university can be fulfilling, but knowing the impact we have on our students, research communities and institutions often weighs heavily on our shoulders.

I was recently honored for an extensive five-year leadership commitment to my university that extended through the pandemic. During the ceremony, I looked at the award and noticed not only that my name was misspelled but also that I had received credit for only two of the five years of service.

I privately commented to a colleague that my name was misspelled, and their response was "Oh, just be thankful."

In that moment, I felt belittled and that my contributions were diminished. My colleague may have been well-intentioned, but that comment still caused harm, and I no longer felt that my interactions with them were in a safe space.

It might have been less of a blow if the group presenting the award hadn't worked so closely under my leadership, which means they should have known how to spell my name. Names carry monumental weight; spelling and pronouncing them correctly are signs of respect.

Why we need self-care

Being a faculty member at a university can be fulfilling, but knowing the impact we have on our students, research communities and institutions often weighs heavily on our shoulders. We must balance our personal and professional responsibilities under the stress of managing expectations in a competitive work environment.

This stress is compounded for those of us who are from historically marginalized and underrepresented backgrounds.

One source of stress can be the way others respond to our names. People of color are often discriminated against in the hiring process if their names are perceived as too ethnic. Author Minda Harts writes in the book "The Memo: What Women of Color Need to Know to Secure a Seat at the Table" that she shortened her name due to workplace bias, and the need to do so caused her emotional harm. Names are important in many communities and are worthy of respect.

And it's not just names. Systemic practices, such as a lack of mentoring, support and understanding of the impact of intersectionality, disproportionately affect us. Our multiple identities play a critical role in our research, teaching and service work. Furthermore, we are exposed to macro- and microaggressions that leave us mentally and emotionally exhausted.

Macroaggressions are, as the name implies, often easy to recognize, but microaggressions are subtle acts of exclusionary behavior in the form of everyday insults, demeaning messages and indignities; women and people from historically marginalized backgrounds are often on the receiving end of these messages. Our colleagues make assumptions about our knowledge and abilities, even though our accomplishments, titles, work experience and credentials are similar

to theirs. I have received unsolicited advice about my career path from people who know little about me or my circumstances.

These comments can be mean-spirited or well-meaning. They also can be exhausting and debilitating, leaving us feeling isolated, especially when we are blindsided by someone we perceived as a well-meaning ally.

Such comments and actions affect the mental health of the people on the receiving end. Microaggressions can create anxiety and self-doubt, leading to depression and hypertension. Harts, who also authored the book "Right Within: How to Heal from Racial Trauma in the Workplace," writes of how difficult it is for people of color to show up in the workplace as their authentic selves. Therefore, self-care is necessary, and we need to make it a priority.

Self-care can take many forms, as you'll see from my list below. I want to focus on two resources that I've found especially helpful.

Community

Many wonderful groups exist within academia and science; however, not all include people who share our particular experiences. I found my community in the Society of STEM Women of Color, or SSWOC, a diverse group of people who are committed to an intersectional approach for empowering women of color in the science, technology, engineering and mathematics fields.

Prior to attending the SSWOC's annual conferences, I felt confused, isolated and alone. Because microaggressions can be so subtle, it was difficult to understand what was in my head and the intent of other's words and actions. The SSWOC introduced me to women of color who were

telling my story but with different faces. In this group, I found strength, clarity, training, sisterhood among diverse women, my voice, my place and empowerment.

In reference to self-care, this is the single most important conference of the year for me. I am fortunate that my college has sponsored my participation. For faculty of color from assistant professors to administrators, I cannot stress the value of this conference enough.

Counseling

I have been helped and encouraged by reading Harts' books, specifically on the subject of seeking counseling.

Historically, many Black and brown communities stigmatize those who seek mental health help. Please know that it is a strength and not a weakness to recognize when you need to speak to a professional. You are not weak or abnormal. Whatever the circumstances, it's OK to seek help.

In "Right Within," Harts writes about her journey as she sought counseling; she says it is a private decision that you are not obligated to discuss with anyone.

When I attended the SSWOC conference a couple of years ago, we were given a homework assignment to determine the self-care we would do. I knew I wanted to discuss my issues in a safe space without constantly relying on friends and colleagues. However, it was difficult to find a counselor who would check all my boxes. I wanted an African American woman who had a Ph.D. and understood academia. That significantly reduced my pool. Therefore, it took time to find her, but I did — and she was in my health care network.

Allyship

If academic institutions are truly invested in diversity, equity, accessibility and inclusion, they must create places where women and people from historically marginal-

ized backgrounds feel they belong and spaces where it is safe for them to work.

If you are a faculty member who wants to be an ally, consider this: When you see a colleague being bullied or subjected to microaggressive behavior, do not stand by and do nothing, especially if you are in a position of authority. How you react will depend on the situation. You can address the bad behavior by calling it out, counteracting it with reason and constructive solutions, or adding validity to the argument on behalf the person who is the target of the behavior.

In situations where injustices against any group are occurring, do not allow whoever is on the receiving end to stand alone. Provide public allyship. Don't send private emails of support — if you don't have the courage to say it in the public moment, do not say it in private.

Self-care is not the solution to these deep-rooted problems. It is a tool we can use to survive. Should you choose self-care, especially in the form of counseling, understand that the work is difficult and, as Harts writes, the journey is continuous. You did not arrive at your current status overnight. It will take time, effort, self-reflection, truth and vulnerability to undo the damage. Remember to be patient and kind to yourself.

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Guidelines

A person's response to injurious behavior can vary. Someone with thick skin may not appear to respond at all, while someone attuned to their feelings may be more sensitive. We are all human and have some type of emotional response to how we are treated whether we admit it or not.

There is no right or wrong way to feel about your experiences. Simply recognize how you feel and try to assess why you are feeling this way and then determine your response. The following tools can be useful, and I invite you to consider using them to practice self-care as you navigate academia:

1. **Seek counseling.** If you think individual counseling will be too expensive, call your insurance company to find someone who is in your network. Then determine your requirements. If counseling is not an option, a life coach (available through an online search) can help you implement a daily routine and action plan.

2. **Keep a journal.** Journaling can reduce depression and anxiety while allowing you to express your emotions with clarity. It also can help you process your experiences. You can just pull out a sheet of blank paper (or a Word doc) and start writing. Or, if you want more structure, try a journal created by a life coach.

3. **Do not normalize injurious behavior.** Don't make excuses for people who cause harm or engage in microaggressions. Do not positively reinforce their behavior. If possible, turn the situation into a teachable moment. Decide if you should respond. Take time to process what has happened, along with your thoughts and feelings, before responding. Consider your vulnerability. Harts suggests asking yourself three questions to protect yourself as you proceed: (1) Does it need to be said? (2) Does it need to be said now? (3) Does it need to be said by you?

4. **Say no.** Learn to refuse requests for extra service, especially at the assistant and associate professor level on the tenure and promotion track. Ask yourself how this extra duty will affect your career and ability to be promoted. If service is not helping, then focus on your research and teaching.

5. **Don't become comfortable being unhappy.** When you're constantly bombarded with stress, it is easy for feelings of unhappiness to become your norm. Recognize your triggers. Take a moment to deal with stress in the moment so you can move on. Do not allow negative scenarios to play over in your head. Have professionals help you work through situations. Do not become a high-functioning and yet unhappy person.

6. Don't get comfortable in toxic environments. Find a support system outside your department and institution to help you work through traumatic experiences. Don't simply be with people who agree with you; seek out those who hold you to the truth and to finding solutions. And do the same for them. Be accountable for your growth and healing.

7. If a safe space doesn't exist, create it in your scientific community or academic institution. It does not need to be formal. In a safe space, you should be able to show up as your authentic self and express your experiences without fear of retaliation or being judged, or of anyone displaying microaggressive behavior.

8. Take care of yourself. Exercise is the most underrated and underutilized antidepressant. It is also free. Create a friends circle outside of academia and hold one another accountable with a workout routine and healthy eating.

9. Find great resources. Reading books; attending conferences; and participating in workshops and academies on leadership and diversity, equity and inclusion can help you address some of these issues while providing clarity on who you are as an academic and within your local environment. Formal training also can provide knowledge and insight about how to teach and mentor while developing your leadership qualities.

Here are a few of my favorites:

- "Right Within" by Minda Harts is an excellent read full of suggestions for dealing with emotional trauma in the workplace. It added insight and clarity to my experiences and empowered me by providing information to address negative emotions and experiences. It is available through Audible.
- "The Memo," also by Harts, teaches women of color how to take charge of their career development while becoming their own sponsors at work and in their careers.
- The Society of STEM Women of Color is committed to an intersectional approach toward empowering women of color in the STEM fields.
- Podcasts can be relatable, supportive and empowering both mentally and emotionally. Harts lists a lot of them in "The Memo" and has one of her own called "Secure the seat."
- Justina Ingram–Jennings is an expert life coach on anxiety and depression and has a structured journal you can use.

No meeting is complete without career programming

At #DiscoverBMB, bite-sized sessions and one-on-one interactions will support your career needs

By Kirsten Block

In the mood to explore different career paths or sharpen your transferrable skills to make yourself a more effective member of the scientific workforce? Look no further than Discover BMB 2023, the American Society for Biochemistry and Molecular Biology's annual meeting, March 25–28 in Seattle.

Centrally located in the exhibit hall right next to the ASBMB booth, the career center will have a schedule packed with career programming each day of the meeting. Whether you're currently looking for a job, planning to enter the job market soon or looking to enhance the career you already have, we have you covered.

Our career program includes four main components:

Mini sessions

We're setting aside specific days and times when you can stop by the career center for a new topic every half hour. Be sure to check the schedule.

Come hear about career paths in the broader field of scientific publishing, see whether your interests align better in a large or small industry setting, or learn what consulting careers actually entail on the day-to-day.

Participate in skill- or tool-focused discussions; brush up on your negotiation strategies or learn how to leverage social media to promote your science and yourself. We aim to cover a range of tools, skills and careers of interest to those both inside and beyond academia.

One-on-one coaching

Would you like to meet with an expert to review your specific aims or prepare for an interview? Stop by the career center to reserve a spot with a coach. We'll have several experts on hand each day to offer guidance on a variety of topics. Be sure to check in at the career center or check us out on social media to see what topics are offered each day.

And if you're interested in helping out as a coach, be sure to note this in your meeting registration form so the ASBMB professional development team can coordinate logistics with you.

LinkedIn profile reviews

Just like your CV or resume, your LinkedIn profile should showcase what sets you apart from everyone else out there in the job market. Stop by the career center and pull up your LinkedIn profile on your phone or computer. Our experts will suggest tweaks and enhancements you could make to help you stand out from the crowd.

Job board

Do you have an opening in your lab or business to advertise to meeting attendees? Or are you looking to leverage Discover BMB to find your next position? The job board is the place for you to post and discover your next career step.

Meetup spaces throughout the exhibit hall are a convenient option for informal interviews as well, so don't pass up the opportunity to leave the meeting with a promising candidate or career prospect.

And smile!

The ASBMB has lined up a photographer to take headshots of attendees one day of the meeting. While the photographer is not officially part of the careers programming, be sure to check the schedule. You might want to add this fresh professional photo to the LinkedIn profile you just reviewed.

Kirsten Block (kblock@asbmb.org) is the ASBMB's director of education, professional development and outreach. Follow her on Twitter: @kfblock.

Connect with colleagues at an ASBMB conference

The ASBMB organizes virtual and in-person events that cover scientific research, educational best practices, the funding environment and more.

Upcoming ASBMB conferences

Deuel conference on lipids
March 7–10 | Dana Point, Calif.

Discover BMB
March 25–28 | Seattle

Motifs, modules, networks: Assembly and organization of regulatory signaling systems
July 11–14 | Potomac, Md.

Transforming undergraduate education in the molecular life sciences
July 27–30 | Boston

CoA and CoA-derivatives
Aug. 15–18 | Madison, Wis.

Explore all upcoming events at asbmb.org/meetings-events.

ASBMB
American Society for Biochemistry and Molecular Biology

What's your interest?

#DiscoverBMB has a group for that

Interest group sessions at Discover BMB 2023 in Seattle will bring together attendees with similar scientific and pedagogical interests to share their recent findings, exchange ideas and establish connections.

The sessions will be held on the first day of the meeting, March 25, and feature speakers, discussion groups, breakouts and other types of networking activities. These connections are so important that the groups will reconvene during meetups in the exhibit hall on subsequent days of the meeting.

The 2023 interest groups are described briefly below. You can read more detailed information provided by the organizers at discoverbmb.asbmb.org/program/interest-groups.

Bile acids: Fantastic beasts or fantastic molecules?

Sayeepriyadarshini Anakk, University of Illinois Urbana–Champaign
Paul Dawson, Emory University

Get together with others who are fired up about the different types of bile acids and their functional significance. Hear talks about how to measure them, how they affect physiology, how they interact with microbiota and other aspects of bile acid receptor signaling. Share the successes and challenges of your related research during one-on-one chats with colleagues after the panel discussion.

Biochemistry and climate change

Karla Neugebauer, Yale University
Henry Jakubowski, College of Saint Benedict and Saint John's University

Learn about biochemical adaptations to climate change, renewable building materials, how biochemistry educators are incorporating climate change into their courses, and what scientists can do to inform the public about and inspire climate action. Participate in group discussions and join the Biochemistry for Climate Change Action Group.

Building research and mentoring networks for women at predominantly undergraduate institutions

Marilee Benore, University of Michigan–Dearborn
Jennifer Roecklein–Canfield, Simmons University

Weigh in on how women at primarily undergraduate institutions can identify and interact with the right mentors for them, especially during the pursuit of tenure and promotion; how to establish a sustainable research program and forge productive collaborations; and how to select the right journals and reviewers for manuscripts. Listen to a panel of speakers and then participate in small group discussions.

Empowering trainees: A roundtable with the IUBMB Trainee Initiative

Elyse S. Fischer, MRC Laboratory of Molecular Biology and the IUBMB Trainee Initiative
Brianna Bibel, University of California, San Francisco, and the IUBMB Trainee Initiative

Find out what the International Union of Biochemistry and Molecular Biology's Trainee Initiative is all about and how it can help you navigate your career. This global endeavor is run by and for trainees (from high schoolers to postdocs). It provides networking events, skills training and a community of support. Find answers to your questions and advice about life in science during a roundtable discussion.

Engineering enzymes and micro-organisms to replace petroleum products with renewable biofuels and biomaterials

Robert B. Rose, North Carolina State University
Josh Michener, Oak Ridge National Laboratory

Learn about enzyme- and microbe-engineering strategies being investigated to eliminate the use of petroleum products. Hear about carbon-capture approaches, synthe-

sizing biomaterials from waste carbon, adapting enzymes from thermophilic organisms and more. Share techniques and ideas during a forum that follows talks by invited speakers.

Molecular engineering

Juan L. Mendoza, University of Chicago
Vince Luca, Moffitt Cancer Center and Research Institute

Listen to talks about computational and protein-engineering approaches finding answers to structure–function questions. Speakers will discuss computational protein design, directed evolution, X-ray crystallography, cryo-electron microscopy and other techniques. During a Q&A session, find out what you want to know about research to elucidate key enzymatic processes of cells.

Posttranslational modifications

Fangliang Zhang, University of Miami Miller School of Medicine
Lauren Ball, Medical University of South Carolina
Jerry Workman, Stowers Institute for Medical Research

Engage in discussions about the roles that post-translational modifications play in physiology, disease and environmental response. Speakers will discuss new techniques to detect and functionally evaluate PTMs, lysine acetylation and cysteine oxidation, and more. Join investigators with diverse expertise for a panel discussion and roundtable exchanges about PTMs as they relate to gene expression, signal transduction and stress response.

Teaching Gen Z: Challenges and opportunities

Nancy Rice, University of South Alabama
Pamela Mertz, St. Mary's College of Maryland

Join other educators in a discussion about teaching undergraduates in Generation Z. Talk about your professional goals and how things work, or don't work, at your institution. Open up about the challenges the COVID-19 pandemic has created for you and your students and the adjustments you've all made. Find a community of colleagues with common concerns, and share best practices.

American Society for Biochemistry and Molecular Biology

Discover BMB | 2023

SEATTLE | MARCH 25-28

Discover BMB is the annual meeting of the American Society for Biochemistry and Molecular Biology.

Deadlines:
Late-breaking abstracts: Jan. 18
Early-bird registration: Jan. 31
Housing: Feb. 14

Visit discoverbmb.asbmb.org

Learn about the latest, most impactful research findings in the molecular life sciences

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Present your work as a poster presentation or short talk