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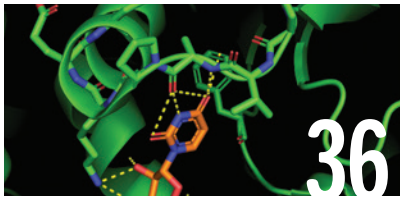

PERSPECTIVES

ASBMBTODAY
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Building community

By Comfort Dorn

My first journalism job was at a tiny (circulation: 1,500) weekly newspaper that covered the rural town we lived in when my kids were growing up. I was hired as a freelance reporter and photographer, paid (as I dimly recall) about $1 an inch for articles and $3 for each photo — more if they made the front page.

It was a great job for a mostly stay-at-home mom (I had a toddler and two kids in elementary school). I was going to tons of community events already. All I had to do was bring my camera, interview a few people and write an article after the kids were in bed. Sometimes I did in-depth interviews with local celebrities like the bus driver who'd had two sets of triplets on his route.

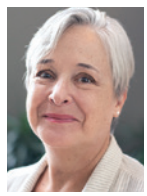
As I cruised around in my minivan snapping photos and scribbling in notebooks, I came to realize that the real purpose of this paper was to keep a small town feeling small. Sprawling housing developments had sprung up in the preceding decade, and longtime residents grumbled. By putting as many people as possible in our little tabloid, we helped everyone feel like they knew each other. No story was too insignificant if we could get a new name and face out into the community.

Many years and several publications later, I still believe one of my most important jobs is helping people feel like they know what's going on with the members of their community. That's why one of the most important parts of ASBMB Today is our Member Update section, which is right at the front of our print magazine, and a weekly anchor on our website that we fondly call Member Monday. This is where we share good news about you and what we refer to as your "awards, promotions, milestones and more."

I scroll through Google searches looking for this news. Angela Hopp, our executive editor, gets tips from Twitter. We pull all this information together, and science writer Laurel Oldach writes the lion's share of the articles (including good thumbnail descriptions of each person's research). Lately, our volunteer contributors have taken on the responsibility of writing In Memoriam member obituaries. They do a fantastic job.

We hope you enjoy reading about your fellow American Society for Biochemistry and Molecular Biology members and sharing your own good news. To the latter point, I urge you to let us know about the noteworthy events in your life. Drop an email to asbmbtoday@asbmb.org with the subject line "Member news" — or tell your institution's communications office to send us a press release. Please don't be shy. We're quite discreet; no one will know where we got the tip. Just think of it as doing your part to build community in the town of ASBMB.

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



Tabak takes over temporarily at NIH

Lawrence Tabak, a dental researcher and until recently the deputy director of the National Institutes of Health, has taken over as acting NIH director. He will serve until a new director is appointed by the president and confirmed by the Senate, a process that previously has taken from four months to more than two years.


TABAK

Tabak joined the NIH in 2000 as director of the National Institute of Dental and Craniofacial Research. He became principal deputy director and deputy ethics counselor of the NIH in 2010. As interim director, he succeeds outgoing director Francis S. Collins, who stepped down in December after leading the organization from 2009 to 2021, and with whom he worked closely. According to a Rochester University press release, Tabak is believed to be the first dentist to lead the NIH.

As longtime deputy director, he already is involved in many of the NIH's current projects and familiar with its challenges. Some of the themes that may define his tenure include the federal response to the COVID-19 pandemic including development of tests and therapeutics and research into complications such as long COVID-19; the fate of the Biden administration's proposal for a DARPA-like high-risk health research agency; and controversial efforts to reduce international influence on researchers at American universities, which have resulted in several high-profile convictions. Tabak also has been involved in NIH UNITE, an agencywide project to redress structural racism in NIH funding and hiring that launched last year.

Prior to taking his first NIH post, Tabak was a professor of dental research and biochemistry at the University of Rochester for 14 years, rising to direct the university's center for oral biology and serve as senior associate dean for research. His own research focuses on glycoprotein structure and synthesis; he has studied salivary mucins and various glycosyltransferases. During the pandemic, his lab also has investigated glycosylation of the SARS-CoV-2 spike protein and how the modification alters its cleavage by the protease furin.

Tabak earned a dental degree from Columbia University and a Ph.D. from the University of Buffalo, where he studied the pathogenicity of bacteria found in dental plaques. He is a member of the National Academy of Medicine and has been a member of the American Society for Biochemistry and Molecular Biology since 1988.

Partch wins NAS molecular biology award

Carrie Partch, a professor of chemistry and biochemistry at the University of California, Santa Cruz, received the National Academy of Science Award in Molecular Biology, which recognizes a "recent notable discovery in molecular biology by a young scientist who is a citizen of the United States."

Partch studies the molecular mechanisms of circadian signaling in mammalian and bacterial cells. Her lab is interested in protein complexes that assemble and disassemble, or change conformation, in a rhythmic way regulated by phosphorylation or other post-translational changes, enabling cells to keep time even when circadian cues are removed.

Cryptochromes are key circadian signaling proteins, and Partch is interested in their structure. Two cryptochromes in mammals belong to a transcription factor complex that represses transcription when they are present but activates it when they are absent. Partch's team identified an intrinsically disordered region in one of the two cryptochromes that controls how tightly the protein's folded domain can bind to the transcription factor and reported a mechanism by which the loss of that region causes a human condition called delayed phase sleep disorder.


PARTCH

Meanwhile, Partch's lab also studies a much simpler circadian system found in cyanobacteria, which behave differently by day and night. In collaboration with the labs of Andy LiWang and Susan Golden, they developed a method to monitor interaction between proteins in this system, which researchers knew can reconstitute a post-translational oscillator that will run for days. By adding upstream and downstream signaling proteins, the team demonstrated how rhythmic DNA binding can be regulated through autophosphorylation and conformational changes.

Working with circadian biologist Aziz Sancar, Partch earned her Ph.D. in biochemistry and biophysics at the University of North Carolina, Chapel Hill. She conducted postdoctoral research in two labs at the University of Texas Southwestern Medical Center and has been on the faculty at UC Santa Cruz since 2011.

The Award in Molecular Biology,

one of 18 annual awards the NAS announced recently, includes a prize of $25,000.

Burrows, Seidah join Canadian academy

The Canadian Academy of Health Sciences' latest list of new fellows includes two ASBMB members, Nabil Seidah and Lori Burrows.

Lori Burrows is a professor in the department of biology and biochemistry and associate director of the Michael G. DeGroote Institute of Infectious Disease Research at McMaster University in Hamilton, Ontario. Her lab studies how bacteria interact with surfaces to form biofilms that can resist treatment with antibiotics. They focus particularly on pili, protein filaments that extend from the bacterial surface and can be retracted or used to sense surfaces and other features of the environment. In addition to studying pilus structure and assembly, the Burrows lab is interested in the development of biofilms, mats of bacteria that grow on surfaces and can resist treatment with antibiotics.

BURROWS

She is a fellow of the American Academy of Microbiology and received the Murray Award for Career Achievement from the Canadian Society for Microbiologists. She serves on the editorial board of the Journal of Biological Chemistry, among other journals. She earned her Ph.D. at the University of Guelph, studying bacterial genetics.

Nabil G. Seidah is director of the laboratory of biochemical neuroendocrinology at the Institut de Recherches Cliniques de Montréal. His lab studies a family of proteases called proprotein convertases, which remove sections of proteins to convert translation products into their active form as hormones, integrins, transcription factors, receptors, viral glycoproteins or other entities.

Perhaps the most famous one they study is PCSK9, which Seidah cloned and showed has a direct link to familial hypercholesterolemia. Since making that discovery in 2003, Seidah's lab has continued to pursue investigations into how circulating PCSK9 and its expression in different tissues regulate cholesterol metabolism and how the protein affects disease states, such as cancer and viral infections.

SEIDAH

During the pandemic, the lab also has shown that the proprotein convertase furin is critical in the activation of the spike protein of SARS-CoV-2 and infectivity of this coronavirus.

Seidah attended Cairo University as an undergraduate and earned his Ph.D. at Georgetown University before moving to Canada. Among his many awards and honors are membership in the Royal Society of Canada, the Order of Canada and the Order of Québec; metabolic research awards from Pfizer, Wilder Penfield, Akira Endo and Lefoulon Delalande; and other awards in cardiovascular and lipid research.

Jimah appointed at Princeton

John Jimah, a member of the inaugural class of ASBMB MOSAIC scholars, who was until recently a postdoctoral fellow at the National Institute of Diabetes and Digestive and Kidney Diseases, has been appointed assistant professor in Princeton University's department of molecular biology.

Jimah is a structural biologist, focusing on the mechanism of membrane remodeling in human cells and malaria parasites. Previously, he discovered the mechanism of the malaria vaccine candidate CelTOS in forming pores in human and mosquito cells to allow parasite traversal and propagation. His recent postdoctoral studies on the architecture of human cell membranes include elucidating the mechanisms of dynamin–actin interaction during cell–cell fusion and dynamin-mediated membrane fission during endocytosis. The project he received MOSAIC funding for is titled "Structural basis of dynamin-mediated membrane fission, actin bundling and interaction with binding partners."

In addition to cryo-electron microscopy and tomography methods, Jimah uses a technique called cryo-correlative light and electron microscopy — which combines multichannel fluorescence imaging of a specific set of proteins with electron microscopy that gives more information about their structural context within cells — and plans to introduce it to Princeton's cryo-EM facility.

JIMAH

Jimah, who was raised in Ghana and attended Colgate University as an undergraduate, earned his Ph.D. in biology and biomedical sciences at Washington University in St. Louis. While a postdoc at the NIDDK, he helped to start a seminar series called Trainees

Recognizing Excellence and Diversity in Science, or TREaDS.

Bornfeldt gives ATVB Duff lecture

Karin Bornfeldt, a professor at the University of Washington and an associate editor of the Journal of Lipid Research, delivered the 2021 George Lyman Duff memorial lecture at the American Heart Association's annual meeting, which was held virtually in November.

Bornfeldt, who has been at UW since she was hired as an assistant professor in 1998, spoke about her research into mechanisms for the increased risk of heart disease that many people with diabetes face. Her lab discovered that even though diabetes primarily affects sugar metabolism, lipids are more important than glucose in accelerating atherosclerosis as a complication of diabetes.


BORNFELDT

The Duff lecture, established in 1956, commemorates a founding member of the Society for the Study of Arteriosclerosis, which is now part of the American Heart Association. George Lyman Duff was a pathologist who studied arteriosclerosis and was a professor and later dean of the faculty at McGill University. The award now is administered by the Council on Arteriosclerosis, Thrombosis and Vascular Biology.

Sullivan named interim chair at Indiana U

Bill Sullivan, Showalter professor at Indiana University School of Medicine, will serve as the interim chair of the pharmacology and toxicology department starting in June. He succeeds Bryan Yamamoto, who is retiring after holding the post for seven years, and will serve until a new chair is named.

Sullivan's research focuses on the parasite Toxoplasma gondii, which he first became interested in as a graduate student at the University of Pennsylvania. After earning his Ph.D., he completed postdoctoral fellowships at Eli Lilly and then at Indiana University School of Medicine, where he became an assistant professor in 2003.


SULLIVAN

T. gondii, an intracellular protozoan parasite that famously can be acquired from cat litter, can cause birth defects if contracted during pregnancy, sparks opportunistic infection in people whose immune systems are suppressed and increasingly appears to be linked to neurological disorders such as schizophrenia. Sullivan's lab seeks tractable drug targets, focusing particularly on T. gondii enzymes that regulate gene expression: histone acetyltransferases that alter epigenetic status, eIF2 kinases that control translation initiation and acetylases that operate outside of the nucleus.

Sullivan dedicates considerable energy to popular science communication. He is the author of the 2019 book "Pleased to Meet Me: Germs, Genes and the Curious Forces That Make Us Who We Are" and is a prolific writer for popular science magazines, websites and other outlets — including ASBMB Today. He is also chair of ASBMB Today's editorial advisory board.

PR award for Bastardo Blanco

Daniel Bastardo Blanco, the global liaison for medical content outreach at St. Jude Children's Research Hospital, received the 2021 Rising Star award from the Memphis chapter of the Public Relations Society of America.

Bastardo Blanco was also a member of an award-winning team. The society's VOX award for internal communications went to his office at St. Jude in recognition of its internal communications to hospital staff on COVID-19.


BLANCO

Bastardo Blanco, who hails from Venezuela, earned his Ph.D. in May 2020 through a joint program between St. Jude and the University of Tennessee Health Science Center. He studied T cell development and activation. He got his start as a science communicator as a mass media fellow for the American Association for the Advancement of Science in the summer of 2019, when he worked at Discover Magazine.

Send us your news!

Have you recently been promoted or honored? Do you have good news to share with your fellow ASBMB members? Email it to us at asbmbtoday@asbmb.org and include a photo!

William J. Lennarz

By Meg Taylor

William "Bill" Joseph Lennarz, a former president and longtime member of the American Society for Biochemistry and Molecular Biology and the founder of the Institute for Cell and Developmental Biology at Stony Brook, died Oct. 27. He was 87.

Born in New York City in 1934, Lennarz shared with many audiences that his two interests growing up were model trains and chemistry, leading him to start college focused on chemical engineering. Switching paths to work under Philip Skell, he received his B.S. in chemistry from Pennsylvania State University in 1956. In heterocyclic chemist Harold Snyder's lab, he worked with boronic acids for localization and destruction of cancer cells, receiving his Ph.D. in organic chemistry from the University of Illinois in 1959. During this time, he became curious about the pathways in cells that allowed for the boron localization. He conducted his postdoctoral research on fatty acid biosynthesis at Harvard University. Working for two years under Nobel laureate Konrad Bloch, he is one of many scientists credited with the discovery of the acyl carrier protein important to fatty acid biosynthesis.

Lennarz began as an assistant professor at Johns Hopkins University in the physiological chemistry department in 1962 and was a full professor by 1971. In his 21 years at Hopkins, he focused on the relationship between lipids and bacterial cell surfaces and showed that lipid-linked sugars are precursors for the synthesis of polysaccharides. In 1983 he was appointed professor and chair of the biochemistry and molecular biology department at the University of Texas Cancer Center, M.D. Anderson Hospital in Houston. There, his studies focused on eukaryotes and lipid production in addition to his ongoing research into the role of cell surface glycoproteins in the fertilization and development of sea urchin and frog embryos.

In 1989, Lennarz made his final move to the State University of New York at Stony Brook, where he was named the inaugural distinguished professor and chair of the biochemistry department. With his leadership, cell biology was named a new area of focus in the department, and he recruited 12 new faculty members

in his 15-year tenure.

Lennarz mentored more than 20 graduate and postdoctoral students and produced more than 200 scientific publications during his career.

In the same year he moved to Stony Brook, Lennarz was elected into the National Academy of Sciences for his achievements uncovering the mechanisms of biosynthesis of glycoproteins and was elected president of the ASBMB. He also served as president of both the Biochemistry Chairman's Organization and the Society for Glycobiology. He received the Society for Glycobiology Karl Meyer Award in 2004, was co-editor-in-chief of the Encyclopedia of Biological Chemistry, and served for many years as an editorial board member for Biochemical and Biophysical Research Communications.

Lennarz is survived by his wife, Sheila; three sons, Willam Lennarz, Matthew Lennarz and wife Kristin, and David Lennarz and wife Alison; stepdaughter, Jennifer Lennarz; stepson, Simon Dorton (Amanda); and many grandchildren.

Meg Taylor (mktaylor4@wisc.edu) is a Ph.D. student in biophysics and quantitative biology with interests in machine learning and protein engineering.

Frank F. Davis

Frank F. Davis, a biochemist who 50 years ago came up with pegylation, a drug delivery system now used in mRNA vaccines, died May 19, 2021. He was 100.

Davis had the idea to attach drugs to a long, water-loving molecule such as polyethylene glycol, or PEG. When attached to lipids, PEG helps coat drugs in an oily layer that water then surrounds so that the kidneys don't quickly purge the body of its medicine. And, since the edge of cells are made of lipids, a cell is more likely to say, "Come right in."

PEG has been used to deliver cancer drugs and to treat what's known as "bubble boy disease" (an immune deficiency so severe that even a small infection can kill. It is now in the mRNA vaccines against COVID-19.

Interviewed by the New York Times in 2001, Davis said, "I have a great feeling of satisfaction that something I did finally worked out." He had patented the idea with former graduate student Abraham Abuchowski in 1979 and started a company in the 1980s, before others became convinced. In his final year, he wrote about the impact of vaccines against a host of diseases, reducing infant mortality in the U.S. from one in 10 in 1900 to less than one in 100 in 2000.

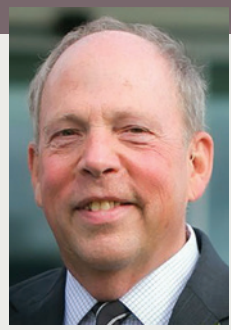
You could say that Davis was a scientific hipster. He studied nucleic acids before they were cool, he made his own sourdough (little changes make a big difference) and he never got a smartphone. Almost 20 years before mRNA vaccines, he wrote that he was "deeply impressed and indeed humbled by how pegnology has grown."

Davis came from a poor background and had a wealth of experience before he became a scientist. Born in Pendleton, Oregon, July 23, 1920, he left his grandfather's farm after a childhood not without tragedy and repaired planes as a mechanic in World War II. With the GI Bill, he enrolled in a chemistry program in Hawaii, completing his doctorate in biochemistry at Berkeley in his mid-30s. It was "the first time in his life that he was challenged at the right level," daughter Ann said. He later moved to Rutgers as a professor of agricultural biochemistry because Berkeley didn't consider people over age 29 for tenure track.

He is survived by his daughter, Ann; his son, Paul; and six grandchildren and great-grandchildren.

— Renae Crossing

Joel S. Bennett



Joel S. Bennett, a blood researcher at the University of Pennsylvania, died June 21 of pancreatic cancer. He was 78.

Bennet was born in 1942 to Marvin and Rhoda Bennett and grew up in Southfield, Michigan. He graduated from the University of Michigan with a pre-med bachelor's degree in 1963 and a medical degree from the University of Michigan Medical School in 1967.

After earning his M.D., Bennett went to University of Pennsylvania for a residency in internal medicine and a fellowship in hematology–oncology. Outside of briefly serving as a physician in the U.S. Air Force, Bennett remained a member of Penn's medical and academic community for over 40 years.

Bennett's research focused on understanding the biophysical and molecular interactions of tiny blood cells called platelets. He was the first to discover that a protein produced by the liver called fibrinogen binds platelets. This binding results in clumping and accumulation of platelets that is important for clotting and can play a role in heart attacks or strokes.

This discovery and Bennett's other research into platelet biology contributed to the development of drugs that block platelet aggregation, commonly known as blood thinners. Today these drugs are critical to preventing blood clots in certain at-risk patients.

Bennett received various awards in recognition of his work, including the Ernest Beutler Prize from the American Society of Hematology, the society's highest honor. He also was recognized by the Association of American Physicians and the American Society for Clinical Investigation.

According to an obituary in The Philadelphia Inquirer, Bennett is remembered by his colleagues for his scientific acumen, devotion to his patients and dedication as an educator.

Bennett is survived by his wife, Evelyn; three sons, Joe, David and Andrew Bennett; two daughters, Lisa Bennett and Lisa Dunn; a brother and sister; and nine grandchildren.

— Courtney Chandler

Thomas Edward Thompson

Thomas Edward Thompson, professor emeritus and former chair of the biochemistry department at the University of Virginia School of Medicine, died Nov. 16 at the age of 95 in Charlottesville, Virginia.

Thompson was born in Cincinnati, Ohio, on March 15, 1926, to Theron and Florence Thompson. After serving in the Army, he completed his B.A. in 1949 at Kalamazoo College and earned his Ph.D. in biochemistry from Harvard University in 1955. He completed postdoctoral fellowships in Sweden and England before becoming an assistant and then associate professor of physiological chemistry at the Johns Hopkins University School of Medicine. He left Hopkins in 1966 to become a professor at the University of Virginia, where he continued to teach and do research within the biochemistry department until his retirement in 1997.

Thompson's research employed biophysical techniques, particularly electron paramagnetic resonance, or EPR, to study the structures and functions of biological membranes. EPR is well suited for measuring reaction kinetics, and with a special focus on the lipid bilayer, he studied transfer kinetics of non-protein-mediated phospholipid transfer and related cholesterol content to the permeability properties and structural parameters of biological membranes. His work resulted in over 200 scientific publications.

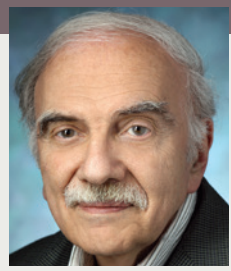
Thompson served as president of the Biophysical Society in 1976 and as editor of the Biophysical Journal from 1987 to 1992. He also served for many years as a scientific consultant to the National Science Foundation and the National Institutes of Health, from which he received numerous fellowships as well as a Research Career Development Award and a MERIT Award. Other awards include the Macy Faculty Scholar Award, the K.C. Cole Award, the Alexander von Humboldt Prize and the Avanti Award in Lipids.

Whether gardening, skiing, canoeing, camping or fishing, Thompson loved to spend time outdoors with his wife of 68 years, Maria-Michaela Smits.

Thompson is survived by his wife and his three sons and their spouses and children: Stephen and Claire and their daughter, Amelia; Christopher and Perrin and their daughter, Elizabeth; and David and Maggie and their children, Henry and Rowan. His oldest son, Peter, died in 1980.

— Heather Masson–Forsythe

L. Mario Amzel



L. Mario Amzel, professor and former director of the department of biophysics and biophysical chemistry at the Johns Hopkins University School of Medicine, died Aug. 28. He was 79.

Amzel was born Oct. 25, 1942, in Buenos Aires, Argentina. He pursued a Ph.D. in physical chemistry from the Universidad de Buenos Aires. Partway through his studies, the Argentinian government was overthrown, and the national universities came under military control. Although many students left, Amzel continued his research using lab space at the Argentinian Atomic Energy Commission.

After earning his doctorate, Amzel was recruited by fellow Argentinian Roberto Poljak to join the department of biophysics (now the department of biophysics and biophysical chemistry) at the Johns Hopkins University School of Medicine in 1969. He remained in the department for over 50 years and was department head from 2006 to May 2021.

Amzel's research focused on determining the structures and functions of proteins and protein complexes. He specifically worked to crystallize and define the structure of an antibody and was part of a team of researchers that produced the first high-resolution images of antibody–antigen recognition, which is critical for immune system function.

Amzel also researched how structure affects the function of PI3K, an enzyme often implicated in cancer, and how proteins regulate sodium channels in cardiac cells, which helps hearts beat.

According to a biography, Amzel spoke about missing Argentinian culture in his new life in the U.S. — he and Poljak were the only two Latinos in the basic sciences at the Johns Hopkins University School of Medicine for several years. As a result, he was a proponent of building a diverse faculty that celebrates cultural differences.

Outside of the lab, Amzel was committed to mentoring Baltimore youth through the Fun with Science Summer Camp and Biophysics Research for Baltimore Teens. Both programs, run by the department, were aimed at getting students into the lab and supporting their futures in science.

Amzel is survived by his partner, Janna Wehrle; one sister; two daughters; and one granddaughter.

— Courtney Chandler

Guido Guidotti (1933–2021)

Remembering a biochemist's biochemist

By Steven G. Clarke

Guido Guidotti, a pioneer in the discovery of the structure and function of membrane proteins, was known nationally and internationally for his research, his inspirational teaching and his mentoring of generations of students in his laboratory.

I was blessed to be a graduate student in Guidotti's lab from 1970 to 1976 during the initial heyday of using sodium dodecyl sulfate, or SDS, gel electrophoresis to analyze membrane proteins. Guidotti, the Higgins professor of biochemistry at Harvard University, was one of the first scientists to realize the power of this technique, arguably allowing for the first proteomic analysis of cells, organelles and membranes to establish the protein composition of membranes.

The discovery that SDS could disaggregate not only complexes of proteins but also complexes of proteins with lipids and nucleic acids allowed researchers to solubilize all the proteins of the cell effectively and then to separate the resulting polypeptides by their molecular size. It was now possible to see just how many different polypeptides it took to make a membrane work and the size and number of these polypeptides.

However, the technique was not without problems. A major difficulty in solubilizing cellular mixtures of proteins with SDS was that some proteases were more resistant to denaturation than other species, leading to the generation of easy targets for the remaining active proteases. This led one prominent group to suggest erroneously that membrane proteins were composed largely of short polypeptides termed miniproteins. A graduate student in the Guidotti lab, John Pringle, solved the problem by rapidly heating the samples for three minutes at 100 °C immediately after SDS and mercaptoethanol were added. This procedure resulted in the rapid inactivation of the proteases and the production of full-length polypeptides.

This technique now is used almost universally in SDS gel electrophoresis, but it is not clear that all those using it know why it is done. Guidotti first applied this new technology to characterize human red blood cell membranes, leading to the characterization of novel transport and cytoskeletal proteins. An immediate fruit of this finding was the discovery by Guidotti and his longtime research assistant Michael Ho that the major red cell membrane polypeptide at about 100,000 daltons (band 3) was the anion transporter responsible for chloride ion and bicarbonate exchange.

DAVID BRANDON (1974 PH.D.)

Guido Guidotti presents at his group meeting in 1973 in the Harvard BioLabs.

The identification and characterization of uncharacterized membrane proteins was a longtime focus of the Guidotti lab. One notable example was their identification of the function of the mammalian CD39 protein, previously known only as a cell surface protein useful for immunophenotyping cells. Through clever biochemistry and bioinformatics (with knowledge of an enzyme from potatoes as a crucial link), they showed that CD39 was an ecto-ATPase, opening the door to understanding the signaling role of extracellular ATP. The Guidotti laboratory were pioneers in characterizing the Na^+,K^+-ATPase sodium pump and its interactions with the insulin receptor pathways.

Guidotti held the American Society for Biochemistry and Molecular Biology's Journal of Biological Chemistry in highest esteem — having a paper accepted there was (and still is) for most of us occasion for celebration. During his career, some 110 JBC papers were published from his laboratory.

Guidotti was renowned for the independence he gave the some 100 undergraduates, graduate students and postdoctoral fellows that worked in his laboratory over the years. Unless he was involved in the hands-on experimentation, he wanted simply to be acknowledged on the resulting papers, forsaking authorship.

Here is a small selection of tributes from Guidotti's former students that describe his mentorship:

What did Guido teach me? Do science for your own enjoyment and not for approbation. Do not wear fashionable clothes. Read the results but not necessarily the discussion, and draw your own conclusions. Doubt a conclusion until your interlocutor convinces you with her argument. Don't be fooled by blowhards. Let each student have the independence and responsibility to learn on his own; sit in your office and let him come to you. Stay in shape by doing exercise you enjoy; if you are not good at soccer, play flag football and surf. If someone is being stubborn, don't give up on her; bring her around. Pack as light as you can. Recognize and respect brilliance, and enjoy its eccentricities. Don't pay attention to the mess. Hold your friends close. But above all, enjoy life!

— Jack Kyte (1972 Ph.D.)
University of California, San Diego

Guido was a true gentleman scientist, with an aura of intellectual curiosity that emanated from him to all his trainees. His knowledge of biochemistry and biophysics was awe-inspiring. Science discussions with Guido were a nonstop exchange of ideas, hypotheses and numbers (How many Na^+ pumps per cell? What is the density of insulin receptors in a membrane?), with nearly all calculations done in his head. He was kind, patient and generous with advice and ideas, with an emphasis on quality over quantity. The field of membrane protein biochemistry has suffered a tremendous loss.

— Marilyn Resh (1983 Ph.D.)
Memorial Sloan–Kettering Cancer Center and Weill Cornell Graduate School of Medical Sciences

A favorite memory for me — Guido in his office, surrounded by neat stacks of JBCs. Always ready to tell me about the amazing paper he had just read and how reading JBC was better than reading the best mystery.
— Betty Eipper (1973 Ph.D.)
University of Connecticut Health Center

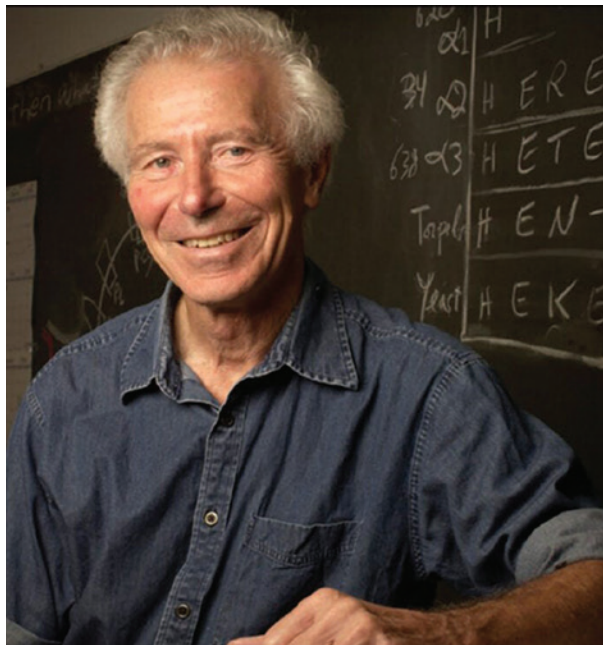


PHOTO © STU ROSNER

Guido Guidotti came to Harvard University as an assistant professor of biochemistry in 1963 and remained for almost 60 years.

For someone who was so completely uninterested in promoting himself or claiming credit for himself, Guido had a huge influence on everyone who passed through his orbit. He inspired us without seeming to and taught us how to do our experiments without micromanaging us in any way. He taught us to be responsible for our own projects, to think quantitatively and to keep our focus on the important questions. He also taught us all, in his own inimitable way, how to get to the heart of a scientific question, how to focus on the big questions at all times and how to evaluate if a paper had proved (or more often had not proved) what it set out to prove.

I specifically remember a comment that he made when someone in the lab wanted to buy some fancy new piece of equipment because it would make the experiments go faster. His response was that if the experiments went too fast, there would be no time to think, and thinking was as important as doing experiments, was it not?
— Anjana Rao (1978 Ph.D.)
La Jolla Institute for Immunology and University of California, San Diego

Within a sea of intense work and competition in the department of biochemistry and molecular biology at Harvard, Guido was an island of calm, a caring mentor and a dedicated scholar. While he rarely sought out an individual and asked about their progress, as a graduate

student I relished my impromptu weekly visits to his office, which began with a gentle knock on the door. On every occasion, he put down whatever he was doing and for the next several hours gave his full attention to my project, often punctuated by visits to the break room with its wall of JBCs, where Guido — like a maestro — would pick out the precise volume containing a piece of information or data that would impact the direction of my project and, ultimately, my career. No one teaches you how to be a professor, ultimately, but I was blessed with having a mentor whom I try to emulate every day.
— Jeff Brodsky (1990 Ph.D.)
University of Pittsburgh

In the early 1970s, I moved to Guido Guidotti's laboratory to learn about membrane-embedded proteins that transport small molecules into and out of cells. At that time, long before cryo-EM, there was little hope of getting detailed protein structures, but Guidotti's lab was leading the world in developing technologies to purify these proteins and identifying which of their regions were inside and outside the cell, ultimately leading to a detailed understanding of how these proteins move molecules across cell membranes.

His graduate students and postdocs were brilliant, and since Guido refused to put his name on a paper unless he did an experiment for the paper, they often were recognized as international leaders from their very first (usually single-author) publication from his lab.
— Lew Cantley (1975–1978 postdoctoral fellow)
Weill Cornell Medicine

In addition to being an extraordinary biochemist, Guido was a superb teacher. I was lucky enough to have been the head teaching fellow for his Biological Sciences 11 class, the main undergraduate biochemistry and cell biology course at Harvard in the 1990s. Guido not only taught me how to teach well but also showed me that having a passion for teaching should be a central part of a career in academia, even at a research-intensive university. In fact, Guido convinced me that teaching and research are synergistic and that effort spent teaching invariably pays dividends in one's research. I don't think it was a coincidence that my most productive period at the lab bench was the five months I spent teaching with Guido.
— Jon Lorsch, National Institute of General Medical Sciences

NANCY KLECKNER

Guidotti teaching his Biochemistry of Membranes course at Harvard in 2020 just before the pandemic.

PHOTO © STU ROSNER

Guido Guidotti and Nancy Kleckner, his wife of 41 years, in 2021.

A life to read

Guido Guidotti's wife, Nancy Kleckner, the Hershel Smith professor of molecular biology at Harvard University, has written and compiled a wonderfully detailed scientific tribute, "Guido Guidotti — A Life," that is available for download from the Harvard Library at dash.harvard.edu. Kleckner details Guidotti's progression from star student in war-torn Italy to Harvard professor, as well as the studies in the Guidotti lab, totaling some 237 publications — the myriad contributions of his laboratory to understanding the role of membrane proteins in transport and cellular signaling reactions.

I had the good fortune to cross scientific paths with Guido on two occasions during his extraordinary career: when I was an undergraduate working in his lab for a few weeks when he had just started out as an assistant professor and during the last 25 years of his life when he was an established leader in the field of the structure and function of membrane proteins. Throughout his career he was fearless, innovative, helpful and gifted with brilliant insights.

As a protein biochemist interested in the structure and function of membrane proteins, he gave more weight to the function than the structure, a characteristic which I surmise came from his original training as a physician. His ability to attract and give free rein to an extraordinary group of junior and more senior scientists amplified his impact on the entire field of membrane protein biochemistry. He had a rare and precious ability to ask the right questions, take on difficult problems, integrate information from multiple sources and design definitive experiments with far-reaching implications for biomedicine.

— Michael Gottesman, National Cancer Institute and National Institutes of Health

Guido's range of knowledge and his ability to make connections between disparate sources of information were daunting. For those of us who continued to consult him for ideas long after leaving his laboratory, before there was Google, there was Guido.

— Kurt Drickamer (1978 Ph.D.)
Imperial College London

Guido and I shared our lives for more than 40 years, bonding over everything from sports to science. Many have attested to Guido's special qualities. As a scientist he was brilliant, imaginative, creative and a profound and knowledgeable thinker. As a person he was kind, humble, caring and giving and took his greatest pleasure in enabling others to succeed and/or simply to survive the tumults of life.

As an example: While many scientists are afraid to read journals for fear they will discover that they have been scooped, Guido would read the pages of the JBC for the pure pleasure of thinking about science, secure in the knowledge that he always would find something interesting to do. When I worried to him once about losing some scientific race, he said, "Well, just go on and tackle the next problem."

— Nancy Kleckner
Harvard University

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Combining retrovirology and mentorship

By Isha Dey

Carol Carter grew up in the Harlem community in New York City, where, she said, "I did not have access to many resources, but I was surrounded by people who cared."

One of those people was an elementary school teacher, Robert Babcock, who gave her discarded library books. One of them was "The Book of Inventions," and Carter said it "described discoveries that individuals had made, and I remember reading it again and again." Another, a volume from an encyclopedia series called "The Book of Knowledge," included epic poetic tales such as Homer's "Odyssey" and "The Rime of the Ancient Mariner."

Carter said these gifts, and the adventures they described, inspired her to seek experiences that involved science and exploration.

Now a professor at Stony Brook University Renaissance School of Medicine, a distinguished retrovirologist and an inventor herself, Carter has, over the years, developed an understanding of the host–pathogen interactions for measles virus; reovirus; influenza virus; and the human immunodeficiency virus, or HIV, the retrovirus that causes AIDS.

Tackling HIV

The HIV epidemic shook the world in the 1980s. A National Institutes of Health researcher and AIDS activist, Nava Sarver, who later became chief of the NIH branch for AIDS research, encouraged Carter to switch from investigating reovirus to the study of retroviruses. The scientific community was struggling to understand how to treat HIV.

STONY BROOK UNIVERSITY

Carol Carter's lab did seminal research in the quest for antiviral therapeutics for HIV.

"There was no vaccine," Carter said. "The field had just started to identify antivirals against viral proteins, but the virus would quickly develop resistance to the available drugs."

About a decade later, during an NIH address to retrovirologists, Carter remembers the spokesperson saying, "You need to think about ways that the virus won't accrue resistance to drugs so quickly."

Carter and other researchers then started to design strategies to target cellular proteins that the virus used — as opposed to viral proteins the virus encoded — as potential antiviral targets.

Using the yeast two-hybrid screening assay (a procedure that then was being developed by Stan Fields and his collaborators at Stony Brook and is now universally employed) along with cell-based assays, graduate students Beth Agresta Lynn VerPlank, and Arthur (Jay) Goff along with postdoctoral fellows Fadila Bouamr, Lorna Ehrlich and undergraduate Tracy La Grassa, discovered that a cellular protein called Tsg101, which normally escorts ubiquitinated cellular proteins to degradative compartments, interacted with the HIV protein Gag, which is critical for HIV replication.

Researchers in the Carter lab and others found that HIV uses Tsg101, a component of ESCRT (endosomal sorting complex required for transport) to reach the cell periphery so it can release its progeny to the extracellular environment rather than undergo degradation. This was the first evidence of a host–pathogen interaction exploited to enable the virus to escape the normal cellular outcome, and it opened new avenues for development of antiviral therapeutics. The labs' breakthrough research was published in 2001, and a description of potential antiviral therapeutics based

on the role of the Tsg101 interaction with ubiquitin in virus production was published in 2017.

Carter's lab now is invested in discovering molecules that could interfere with HIV's life cycle without disrupting human cellular functions. Some of these are effective against other viruses that require Tsg101.

Carter believes intriguing parallels can be drawn between HIV, which causes AIDS, and SARS-CoV-2, which causes COVID-19, for better understanding of how viruses behave, even though the two viruses are completely different. She's impressed at how quickly and cooperatively the scientific community has combined expertise to mobilize resources to fight COVID-19.

A professor at Stony Brook University Renaissance School of Medicine, Carol Carter also mentors high school students at the Cold Spring Harbor Learning Center.

Good luck with mentors

As an undergraduate at the City College of New York, Carter participated in a work-study program with James Organ, a biology professor who studied salamander behavior and reproduction. That was her first lab experience, and Organ introduced her to other faculty members in the biology department. Carter got to know her college teachers as people and learned how to interact with them with confidence, she said.

As a graduate student at Yale University, Carter said, she was mentored by three amazing people: her thesis adviser, Francis Black, who introduced her to his peers who were eminent virologists; Black's research associate Ann Schluederberg, one of the few female scientists at the time at Yale; and Black's technician Dorothy Davis, an African American woman who was one of the very few double minority researchers then at Yale. Davis shared many of Carter's life experiences and contributed to making Black's laboratory a uniquely nurturing environment.

"So, between the three of them, I was in a great environment," Carter said, "and you have to ascribe that to luck."

Carter is a strong advocate for mentorship and has conducted workshops and training activities for high school students, undergraduates, grad students and postdocs. "When I interact with students, I encourage them to be open-minded and curious," she said.

This curiosity can open up new career paths, given the right mentorship, she said, and she advises young scientists not to be hesitant about engaging on diverse topics and asking questions.

A few years ago, with the idea of promoting STEM education among high school students from groups that are underrepresented in health sciences professions (as defined by the National Science Foundation), Carter partnered with Jason Williams, a Stony Brook alum and now assistant director for external collaborations at the Cold Spring Harbor DNA Learning Center, to launch the Science, Technology and Research Scholars, or STARS, camp. Learning Center instructor Brittany Johnson and faculty and staff from Cold Spring Harbor and Stony Brook offer students diverse mentoring opportunities for career development.

"Our intention was to arouse curiosity about science generally and to expand the pipeline of students who ultimately engage in professions linked to it," Carter said.

Now about to begin its fourth year, the STARS camp provides state-of-the-art, hands-on, wet and dry laboratory experiences.

The power of partnership

Over the years, Carter has engaged with researchers from different fields whose varied ideas have helped her answer many scientific questions. One of her favorite works, published in 2001, was the result of a collaboration with Suzanne Scarlata, a biophysicist.

When the two met at a uni-

versity committee meeting, Carter's work on the ability of recombinant HIV capsid proteins to self-assemble intrigued Scarlata, and Scarlata's understanding of biophysical measurements of protein–protein interactions fascinated Carter. Together with physical chemists using static and dynamic light-scattering experiments, they demonstrated that capsid protein sensing of environmental pH and salt triggered its self-assembly and conformational changes.

"These aspects would have never occurred to me, since my training was virology and molecular genetics," Carter said.

While she's had a successful and pioneering career, Carter has had moments she describes as "not so fun," especially with early-stage rejections in grant applications. Now, having enjoyed continuous funding for Tsg101 studies for the past 20 years, she advises younger scientists "to not let setbacks discourage you from trying new or different directions."

When not in the lab analysing data or writing grants, Carter enjoys beach walking, reading mystery stories, solving jigsaw puzzles and trying new recipes. Cooking is like an adventure, she said. "When you don't know what the outcome is going to be, it's exciting — just like an experiment."

So, what drives her ongoing experimentation with viruses? "The fact that we know so little of them still, the fact that as viruses evolve, we evolve with them," Carter said. "They challenge you and your system every day, and that's really fascinating."

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Acylcarnitines, a warning signal for Type 2 diabetes

By Jessica W. Davidson & Judith Simcox

Type 2 diabetes, or T2D, is a chronic disease characterized by insulin resistance that impacts 34.2 million people in the United States. Another 88 million adults are prediabetic, meaning they likely will develop diabetes if they do not receive preventative care. Risk factors for T2D include aging, genetics and obesity. An estimated 89% of adults diagnosed with T2D between 2013 and 2016 were obese.

Irregular lipid metabolism associated with obesity and T2D is termed diabetic dyslipidemia, which includes increased plasma triglycerides and low-density lipoprotein cholesterol. This dyslipidemia occurs in 70% of T2D cases and is associated with higher rates of secondary conditions such as cardiovascular disease. Using mass spectrometry, researchers have found that dyslipidemia is associated with increases in more than 300 lipid species in the plasma, and there is mounting evidence that lipids contribute to T2D as signaling molecules.

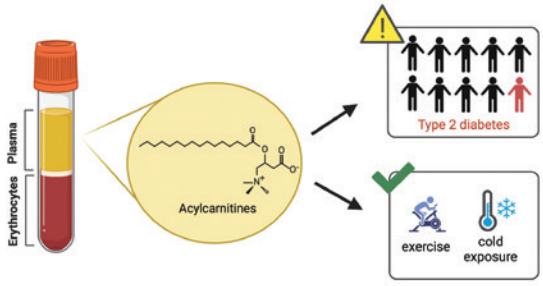
Acylcarnitines, one of the lipid classes elevated in plasma with diabetic dyslipidemia, function in transport and signaling. In cells, acylcarnitines are made when a fatty acid is bound to carnitine on the outer mitochondria membrane by the enzyme carnitine palmitoyltransferase 1, or CPT1. Then acylcarnitines are transported into the mitochondria matrix, where they are converted back to free carnitines and fatty acid to be broken down by beta-oxidation for energy production. Acylcarnitines also can evade mitochondrial entry and are exported to the blood plasma.

Plasma acylcarnitines contribute to insulin resistance in obesity and T2D. Mice with genetic loss of CPT1 have lower plasma acylcarnitines and greater insulin sensitivity, while mice with a more active form of CPT1 have higher levels of acylcarnitines and insulin resistance. When Mary-Ellen Harper's lab at the University of Ottawa treated isolated skeletal muscle cells with acylcarnitines, insulin resistance rapidly developed.

So, why would acylcarnitines signal for insulin resistance?

Plasma acylcarnitines increase in diabetes but also with normal stress such as exercise and cold exposure. Deborah Muoio's lab at Duke University showed that loss of acylcarnitine processing in muscles leads to exercise intolerance, and work from our lab established that mice with a loss of CPT1 are intolerant to cold. A variant of CPT1 is abundant in Inuit populations of Greenland, Alaska and Canada. Work from our laboratory at the University of Wisconsin–Madison describes how this CPT1 variant is constitutively active, leading to higher acylcarnitine levels, which would be beneficial in response to the cold environment inhabited by the Inuit.

Exertion and cold cause organisms to switch fuel sources rapidly from glucose to lipids. Since insulin stimulates glucose uptake, insulin resistance might be advantageous for the switch to lipids. Acylcarnitine signaling could potentiate insulin resistance to facilitate the fuel transition, but the question is how.



Acylcarnitines can be measured in blood plasma using mass spectrometry and are associated with insulin resistance, which can serve as a warning sign for development of Type 2 diabetes. With stress such as exercise and cold exposure, insulin signaling helps with rapid fuel switching, making acylcarnitines beneficial in these states.

As prediabetes and diabetes prevalence increases, we must identify early warning signs and understand the underlying pathobiology. Acylcarnitines are a piece of the puzzle; questions still loom about their transport and regulation in T2D. Understanding how acylcarnitines signal for insulin resistance and their functional role in normal physiology such as cold stress can hold the key to therapeutic intervention for T2D.

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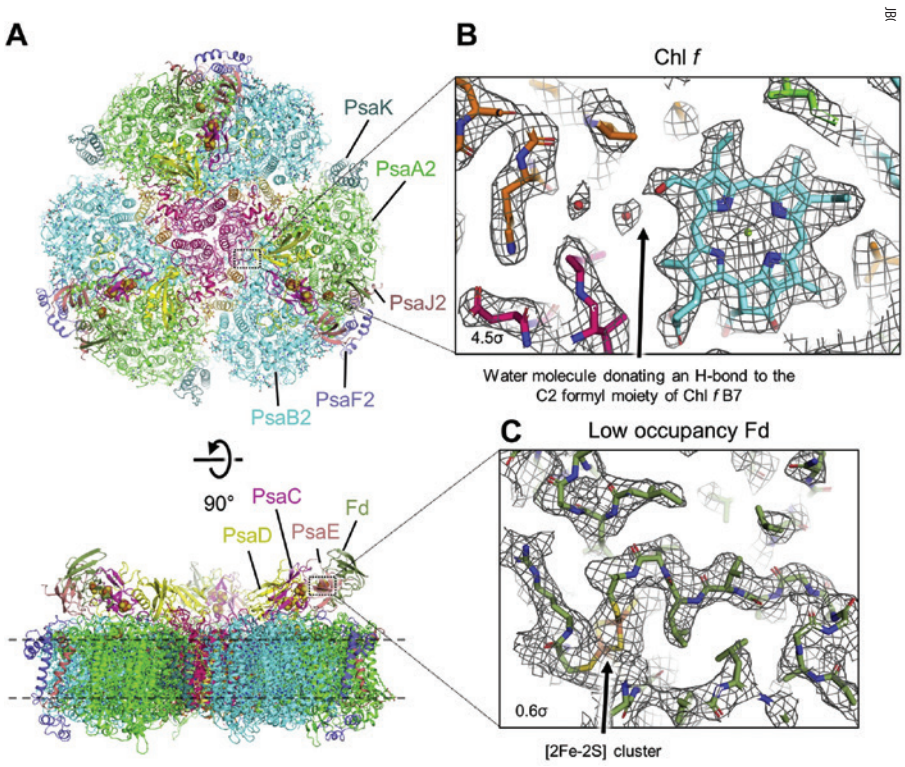
How a cyanobacterium makes far-red light mean 'go'

Researchers identify the locations of structural changes in photosystems I and II that allow growth in far-red light

By Sam Sholtis

A team of researchers led by Penn State scientists has identified the location of changes in the photosynthetic apparatus of some cyanobacteria — formerly known as blue-green algae — that allow the organisms to grow using far-red light. Using high-resolution cryo-electron microscopy, the researchers pinpointed locations in two photosystem complexes within the cyanobacteria that incorporate alternate versions of chlorophyll pigments. These alternates are attuned to longer wavelengths, which allows the cyanobacteria to use far-red light efficiently to perform oxygen-evolving photosynthesis. Considering that the energy available in far-red light is equivalent to 15% of total solar radiation reaching Earth, this ability gives these organisms an advantage in competing with plants and other cyanobacteria for light for photosynthesis.



This overview of the Synechococcus 7335 FRL-PSI structure shows the stromal view (top) and membrane plane view (bottom) of the complete model. In the bottom panel, dashed lines denote the intermembrane region. The subunits are colored individually, and notable subunits focused upon in the main text are labeled.

The structures are described in two papers in the **Journal of Biological Chemistry** and eventually could help researchers engineer crop plants that can use a broader wavelength spectrum of light for growth.

"If you would have asked me 10 years ago if you could grow most cyanobacteria in far-red light, I would have laughed," said Donald A. Bryant, leader of the research team. "But it turns out that if you put them in far-red light, some cyanobacteria activate a set of about 20 genes that allow them to modify their photosynthetic apparatus and the chlorophylls that they produce so that they can use far-red light for photosynthesis. Since making that discovery in 2013, we have been trying to understand how that works."

Cyanobacteria are bacteria that obtain energy through oxygen-producing photosynthesis and are found almost everywhere, including extreme environments like hot springs, deserts and polar regions. They are among the oldest organisms on Earth, and their ability to produce oxygen through photosynthesis is thought to have been important to changes in the early Earth's atmosphere that paved the way for the evolution of diverse and complex life forms. They are also important model organisms, with potential applications for bioethanol production, as dietary supplements and as food colorings.

When grown under normal

"white" light conditions — that is, visible light, which ranges from violet light with a wavelength of about 400 nm to red at 700 nm — cyanobacteria harvest that light using mainly chlorophyll a, which absorbs light with wavelengths up to a maximum of about 700 nm. When grown in far-red light (up to about 800 nm), some terrestrial cyanobacteria convert a portion of that chlorophyll a into chlorophylls d and f, which absorb longer wavelengths of light. These alternative forms of chlorophyll give such organisms the ability to harvest far-red light and use it efficiently for photosynthesis, which allows those cyanobacteria to thrive in low- or filtered-light environments, such as under plants or trees.

"We knew from isolating and characterizing the complexes that photosystem I contains seven to eight chlorophyll f molecules, and that photosystem II contains one chlorophyll d molecule and four to five chlorophyll f molecules, along with about 90% of the original chlorophyll a, so we wanted to know where those changes occurred in the complexes," said Bryant. "One way to figure that out is to determine the structure of the complexes, but because they are so large and complex — and the chemical differences are so minor — it was extremely challenging."

The photosystem I and II complexes are very difficult to crystallize — because they are very large, membrane-bound complexes — so X-ray crystallography, a standard laboratory method for determining the 3D structures of molecules, was not likely to work. The researchers then turned to cryo-EM, but the tiny differences between the forms of chlorophyll molecules stretched the limits of cryo-EM resolution to detect. The chlorophylls differ at only a few atoms of similar mass.

"My collaborator, Chris Gisriel, who is a postdoctoral fellow in Gary Brudvig's lab at Yale, was fortunate to achieve a very high-resolution structure for the photosystem II complex — 2.25 angstrom (Å) — allowing him to visualize the differences in some of the chlorophylls directly," said Bryant. "The extent of the difference between chlorophyll a and f is that two hydrogen atoms are replaced by an oxygen atom in a molecule with the composition of $C_{55}H_{72}MgN_4O_5$. In a complex like photosystem I that contains nearly 100 pigment molecules and 11 protein subunits or photosystem II with 35 chlorophylls and 20 protein subunits, these small changes are like looking for a few needles in two very large haystacks. Because these chlorophylls confer the special properties that allow far-red light utilization, it is very important to understand exactly how these molecules are arranged."

Most of the time, the oxygen atoms are tied up in hydrogen bonds, so the researchers can look for hydrogen-bond donors that are close to the right places in the chlorophyll molecules. By applying this method and others to the structures determined using cryo-EM, they were able to identify the locations of chlorophyll f molecules in the two photosystem complexes and the position of the single chlorophyll d molecule in photosystem II as well.

"Identifying the structural basis for how this far-red light-absorption occurs in nature is an important step forward," said Gisriel, first author of both studies. "The identification of the precise locations in the photosystem I and II complexes where the alternate forms of chlorophyll are incorporated could open up the doors for exciting future applications. For example, crops could potentially be engineered to harvest light beyond the visible spectrum. In addition, two crops could potentially be grown together, with shorter crops, using the filtered far-red light from their shaded locations beneath taller crops. Alternatively, plants could be grown closer together because of better light capture in the leaves beneath the canopy."

(This article was reprinted with permission from Penn State.)

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There is more to cholesterol than meets the eye

Its role in glaucoma is all about location

By Sarah May

Glaucoma sometimes is called the silent thief in the night, because the eye can be damaged irreversibly before a person experiences any vision loss.

In a healthy eye, tissue called trabecular meshwork controls pressure by draining aqueous humor, the clear fluid filling the space between the cornea and lens. This drainage system clogs up in glaucoma, fluid builds up and the resulting pressure damages the optic nerve that sends visual signals to the brain. In severe cases, the eyes can bulge out.

Understanding how trabecular meshwork cells sense and respond to elevated eye pressure — a type of mechanical stress — is a major goal of researchers in David Križaj's laboratory at the University of Utah. They study a mechanotransducer, a protein that senses and responds to mechanical stress, called transient receptor potential vanilloid 4, or TRPV4. When activated in trabecular meshwork, TRPV4 promotes aqueous humor drainage.

Previously, the researchers reported that a known risk factor for glaucoma, cholesterol, activates TRPV4 in retinal glia cells, which are at the back of the eye. Now, in a recent article published in the **Journal of Lipid Research**, Monika Lakk and colleagues report that cholesterol depletion activates TRPV4 in trabecular meshwork cells at the front of the eye — an unexpected result.

"Cholesterol has been public enemy No. 1 in the eye of the public for a long time due to its dysregulation in cardiovascular, neurologic and metabolic disease, and has been shown to subserve multiple types of inherited and acquired vision loss," Lakk said.

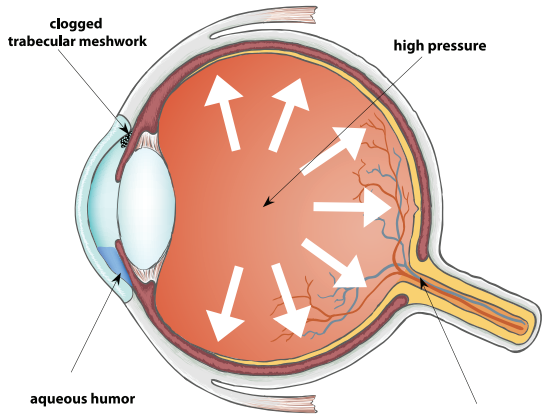
On the other hand, cholesterol plays a crucial role in maintaining homeostasis. The finding that cholesterol regulates TRPV4 in opposite ways depending on its location (front versus back of the eye) demonstrates this complexity. "Clinical solutions may require a thorough understanding of the local biomechanical and cellular context," Lakk said.

According to the researchers, increased membrane cholesterol in trabecular meshwork cells may dampen the mechanical stress signals caused by high blood pressure and prevent overstimulation of TRPV4 — a protective mechanism that may become dysfunctional in glaucoma.

By just stretching the trabecular meshwork cells — simulating what happens with glaucoma — the researchers were able to deplete membrane cholesterol, which activates TRPV4.

"This study was an exercise in surprise," Lakk said. "We were completely unprepared for the finding that membrane lipid composition itself is a function of the biomechanical milieu."

When a person experiences chronic stress due to conditions such as heart disease and glaucoma, she explained, "The cellular remodeling that takes place may involve the entire body and a myriad of processes and mechanisms that may flow under the radar of investigators focusing on immediate targets."



Glaucoma damages the optic nerve and is a primary cause of irreversible blindness.

The researchers have knocked out the TRPV4 gene in multiple eye cell types in mice and are investigating how these cells, which are unable to sense and respond to mechanical stress, affect eye fluid pressure and vision. Since cholesterol can turn TRPV4 on or off in different parts of the eye, their research suggests that glaucoma patients may benefit from carefully balanced diet regimens.

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The 'phospho-dawn' of circadian clock proteomics

By Nivedita Uday Hegdekar

As a Ph.D. student at the University of Edinburgh, Johanna Krahmer was interested in researching circadian rhythms, which are key physiological changes that follow a 24-hour cycle. These natural processes respond primarily to light and dark and affect most living things, including animals, plants and microbes. She joined Andrew Millar's lab, which researched how circadian rhythms are developed and affect plant life from the cell to the ecosystem.

Most genetic studies in circadian biology research have focused on gene expression levels. However, protein abundance and post-translational modifications tell a larger story about circadian rhythms, making it essential to study these changes as well.

"Many transcription factor proteins that genetically control circadian rhythms also undergo post-translational modifications," Krahmer said. "One such modification —protein phosphorylation — is involved in the circadian clock mechanism not only in plants but also in fungi and eukaryotes."

Krahmer was interested in investigating circadian rhythms in protein abundance and phosphorylation PTM changes in a normally functioning circadian clock system. She used mass spectrometry to generate global proteomics and phosphoproteomics datasets on circadian time courses in the Arabidopsis thaliana plant.

"We found that about 0.4% of global proteins but a much larger percentage of the quantified phosphorylation sites were altered due to the circadian clock," Krahmer said. "Furthermore, approximately half of these rhythmic phosphosites were most phosphorylated at dawn, a pattern we termed the 'phospho-dawn.'"

Krahmer discovered that many phosphorylated proteins are those involved in circadian clock regulation, such as MAPK, CK2 and GSK. She also showed that the genetic clock circuit is required for most rhythmic protein phosphorylation.

Using an Arabidopsis thaliana plant line with a disabled clock gene circuit, Krahmer found that most of the most circadian protein phosphorylation was lacking. However, a few phosphorylation sites that fluctuated despite the disabled circadian clock still tended to peak in abundance close to subjective dawn.

"This may suggest that the canonical circadian mechanism is necessary for most but perhaps not all protein phosphorylation rhythms," Krahmer said.

To exemplify in an experimental approach how circadian phosphorylation of a protein can be linked to its function, she analyzed the effect of a mutation in the phosphorylation site on the activity of the metabolic enzyme F2KP (one of the identified proteins in her data sets). F2KP is one of the regulators of carbon partitioning into starch and sucrose. It is necessary to maintain normal growth in fluctuating light conditions. Krahmer showed that the phosphorylated serine of F2KP has functional relevance in plant metabolism. Her findings recently were published in the journal **Molecular and Cellular Proteomics**.

Following her Ph.D., Krahmer pursued postdoctoral research in Karen Halliday's lab at the University of Edinburgh and now works at Christian Fankhauser's lab at the University of Lausanne. Her research interests have expanded to the role of metabolism in photobiology.

"If there is one major takeaway message from my Ph.D. work," she said, "it's that that protein changes and PTMs should be an important part of circadian biology research."

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From the journals

By Clementine Adeyemi, Isabel Casas & Courtney Chandler

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

Scaffolding and structure in brain development

Human neurodevelopmental disorders have a spectrum of phenotypic characteristics involving social interaction; intellectual disability, or ID; and cognitive and memory deficits. In ID disorders such as fragile X syndrome, Rett syndrome and Down syndrome, these traits are the result of developmental disruptions in different regions of the brain, including the hippocampus, which is essential for learning and memory.

Mutations in several genes located in the X chromosome associated with cognitive function can lead to ID and autism; however, many other genes involved, such as connector enhancer of KSR-2, or CNKSR2, remain poorly characterized despite evidence implicating their essential functions in brain development and disease. CNKSR2 is a scaffold protein involved in various intracellular signaling pathways combined with different molecular partners. Its expression is enriched in the brain, and mutations in this gene have been identified previously in people with ID and epilepsy; however, researchers understand little about its function.

In a recent article in the **Journal of Biological Chemistry**, Hidenori Ito of the Aichi Developmental Dis-

The gene–diet link in Type 2 diabetes

Diabetes affects one in five Americans and is the seventh leading cause of death in the U.S. While Type 1 diabetes stops the body from making insulin, Type 2 diabetes, or T2D, prevents the body from using insulin properly and from maintaining normal blood sugar levels. T2D is driven by insulin resistance, which prevents glucose uptake and as a consequence induces a chronic state of hyperglycemia. While overt diabetes involves beta-cell dysfunction and insulin resistance, researchers do not understand fully the cascade of events that leads to T2D.

Insulin resistance affects glucose uptake via glucose transporter type 4, or GLUT4, and is the primary defect preceding T2D. Austin M. Reilly of Indiana University and collaborators previously generated an insulin-resistant mouse model with human GLUT4 promoter-driven insulin receptor knockout, or GIRKO, in muscle, adipose and neuronal subpopulations. The results indicated that additional factors and events lead to overt diabetes.

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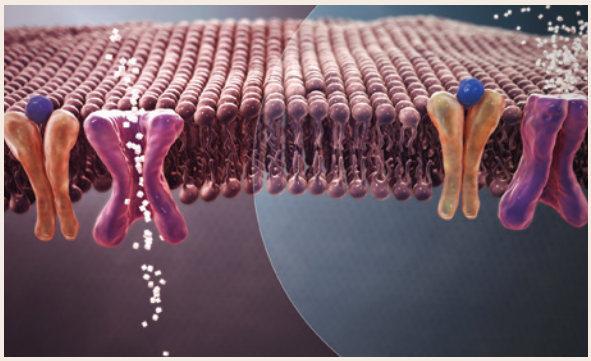


This illustration shows the mechanism of normal blood sugar absorption (left) versus insulin resistance in Type 2 diabetes (right).

In a recent article in the **Journal of Biological Chemistry,** Reilly and a team of researchers characterized the metabolic phenotypes of GIRKO mice fed a high-fat diet, or HFD, to identify other metabolic challenges required for T2D progression. These mice stayed lean on the HFD but developed other features of insulin resistance such as hyperglycemia, impaired oral glucose tolerance, dyslipidemia and increased inflammatory cues in the gut associated with HFD microbiome modifications and higher serum lipopolysaccharide.

Using these mice as a model for insulin resistance, the authors were able to show that an HFD increased T2D progression and that important gene–diet interactions contribute to this phenotype that might be used to develop more efficient treatments.

DOI: 10.1016/j.jbc.2021.101431

— Isabel Casas

ability Center and colleagues identify a complex comprising CNKSR2 and the guanine nucleotide exchange factor cytohesin 2, or CYTH2, necessary for proper neuron development in the mouse hippocampus. They show that CYTH2 binding prevents CNKSR2 degradation. In addition, silencing of CNKSR2 or CYTH2 affects their cellular localization. CNKSR2- and CYTH2-knockdown cells exhibited characteristics of immature granule cells —potentially involving these proteins in neuron differentiation.

The authors conclude that CNKSR2 interaction with CYTH2 is necessary for proper cellular development within the hippocampus via the formation of a stabilization complex of these two proteins.
DOI: 10.1016/j.jbc.2021.101427

Tools to capture O-GlcNAc modifications

The many roles of proteins are made more complex by post-translational modifications, or PTMs, the chemical changes to proteins that are introduced by enzymes such as transferases, ligases and kinases.

The sugar N-acetylglucosamine can be attached to specific protein sites to yield a PTM abbreviated O-GlcNAc. This modification is implicated in various biological processes and diseases, yet our understanding of it has been limited. In a new study published in **Molecular & Cellular Proteomics**, Rajan Burt at the Broad Institute and a team of researchers describe how they developed a technique to study O-GlcNAc modifications.

The researchers modified a traditional approach to protein identification to enrich for O-GlcNAc modifications. Proteins from cells or tissues were cut up into fragments called peptides, which then were combined with an antibody mix that specifically binds to peptides with O-GlcNAc modifications and separates them from nonmodified peptides.

The team used mass spectrometry to identify the proteins and sites with modifications. They applied their technique to synaptic terminals from mouse neurons and identified over 1,300 O-GlcNAc-modified peptides with more than 1,000 modification sites.

This research provides an experimental strategy to map O-GlcNAc modification sites across the proteome, allowing scientists to understand better the diverse functions of this PTM.
DOI: 10.1016/j.mcpro.2021.100167

Fat breakdown: Larger than life and then some

Obesity, connected with high levels of plasma lipids, is, among other things, a risk factor for the world's No. 1 killer disease, cardiovascular disease. Many researchers are working to understand obesity, but it is challenging and complicated. Now, a team of scientists at Umeå University in Sweden has revealed another factor to consider: lipoprotein size.

Normally, the fat we eat is packaged into lipoproteins. Then, an enzyme called lipoprotein lipase, or LPL, breaks down the fat contained in these lipoproteins for energy needs of the body. However, in a recent paper in the **Journal of Lipid Research**, Oleg Kovrov, Fredrik Landfors and colleagues found that the most important determinant of LPL's activity is the size of the lipoproteins.

Surprisingly, the team of investigators found that the levels of LPL's regulators in the body had no significant effect on the lipase's activity under the conditions used. Instead, they discovered that the larger lipoproteins correlated with higher LPL activity, probably due to a larger surface area in these proteins, which meant better returns for LPL's work. This finding has implications for fat breakdown in humans, because the size of the lipoprotein particles varies from person to person and can vary throughout the day depending on food intake.
DOI: 10.1016/j.jlr.2021.100144

Antibody mimetics vs SARS-CoV-2

Designed ankyrin repeat proteins, or DARPins, are a class of antibody mimetics, an alternative to immunoglobulins, that recently have been used as research tool in protein therapeutics. DARPins' potential applications include protein engineering, protein–protein interactions and drug development. They are based on ankyrin repeat proteins composed of 33 amino acids flanked by N- and C-terminal capping repeats, and one single polypeptide chain is able to form a multispecific DARPin as opposed to four polypeptide chains in immunoglobulins.

The recent development of ensovibep, a multispecific anti-SARS-CoV-2 DARPin that entered clinical trials in late 2020, further enhances DARPins' potential. Ensovibep combines five DARPin domains on a single polypeptide chain in which two domains bind human serum albumin and three domains bind the SARS-CoV-2 spike protein. While the C-Cap of DARPins had been investigated in depth, the thermostability of the N-cap of DARPins had not.

In a recent **Journal of Biological**

Chemistry article, Johannes Schilling of Athebio AG and collaborators used computer analysis and a rationally guided alanine scan to determine that position 17 of the N-terminal capping repeat plays a key role in overall protein thermostability. The authors report that the melting temperature increased by 8° C to 10° C when they replaced Asp17 with leucine, valine, isoleucine, methionine, alanine or threonine. They then transferred the Asp17Leu mutation to different backgrounds and showed that in all cases thermostability improved. This mutation, the authors suggest, could be partly responsible for the very high melting temperature (over 90° C) of ensovibep. The authors conclude that N-terminal capping repeats with increased thermostability could be useful for development of innovative drugs based on DARPins.

DOI: 10.1016/j.jbc.2021.101403

A new domain in ubiquitin binding

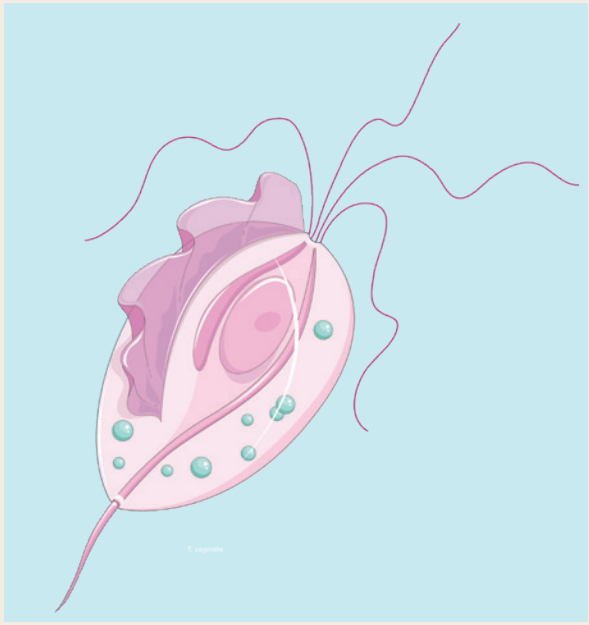
Ubiquitin is a small protein that can be attached to other proteins as a post-translational modification through a process called ubiquitylation. Ubiquitylation has diverse signaling functions that are influenced by the length and type of ubiquitin chains.

Proteins with regions called ubiquitin-binding domains that

Exploring the unknown of a parasite's lysosome

Trichomoniasis, one of the most common sexually transmitted diseases, is caused by a single-celled eukaryotic parasite called Trichomonas vaginalis. As a eukaryote, T. vaginalis has a degradative compartment called a lysosome, about which little is known.

The parasite's lysosome can fuse with transport compartments called phagosomes to form a phagolysosome that then degrades its internal contents. In a recent study published in the journal **Molecular & Cellular Proteomics**, Nadine Zimmann and colleagues from Charles University in the Czech Republic analyzed the phagolysosome of T. vaginalis to better understand its function.



SERVIER MEDICAL ART/WIKIMEDIA COMMONS

A single-celled eukaryotic parasite called Trichomonas vaginalis causes one of the most common sexually transmitted diseases.

The researchers identified 462 proteins located in the phagolysosome. Hydrolases, or enzymes that use water to cleave covalent bonds, were the most common type of protein found.

The team also observed proteins distantly related to receptors that recognize specific sugars known to direct proteins to the lysosome. But T. vaginalis doesn't have any of the machinery necessary to make those specific sugars, called oligosaccharides. The researchers tested whether other oligosaccharide structures were involved in lysosomal targeting instead. They mutated part of a protein known to reside in the lysosome at sites that could attach oligosaccharides and found that the mutant protein could no longer be found in the lysosome. They also observed that by adding oligosaccharide attachment sites to a protein not found in the lysosome, the protein was targeted there. This makes T. vaginalis unique, as most other eukaryotic parasites don't use sugars for lysosomal targeting.

Zimmann and colleagues also inhibited the lysosome and found that enzymes important for infection, such as the TvCP2 enzyme, which breaks down proteins, were secreted via the lysosome instead of the traditional secretory pathway.

This work yields a better understanding of how T. vaginalis uses its lysosome, including the secretion of enzymes involved in pathogenesis, which could provide a future therapeutic target.

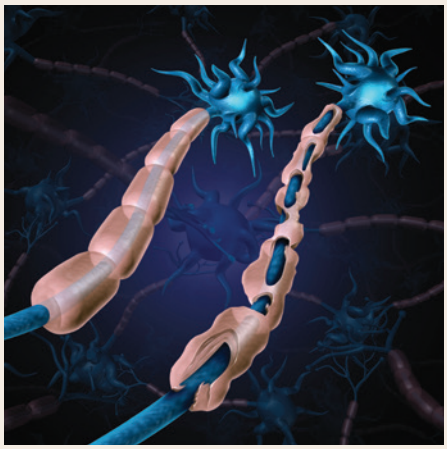
DOI:10.1016/j.mcpro.2021.100174

—Courtney Chandler

Role for protein revealed in myelin disorders

We know that the brain's ability to control our every move is dependent on the many cells it consists of — neurons. Less known is how these neurons rapidly transmit signals that translate to our actions. Acting alone, a neuron might send a signal at just 4.5 miles an hour! Fortunately, they get a speed boost in the form of myelin.

Myelin is the lipid-rich membrane covering the length of most neurons and is an extension of other types of brain cells, namely oligodendrocytes and Schwann cells. This structure shields the electric signals running through our nerves, literally ramping up the speed to as fast as 120 miles per second. So, what can go wrong if neurons lose this on ramp?



A healthy nerve sheathed in myelin (left) contrasts with a nerve with damaged myelin (right) as seen in multiple sclerosis and other chronic disorders.

In a process known as demyelination, neurons can be stripped of myelin, resulting in chronic disorders such as multiple sclerosis. Now, Yiran Liu and David Castano of the National University of Singapore and colleagues have discovered new roles for a protein, ABCA8b, in modulating neurons' myelination.

ABCA8b exists mostly in mice brains and has a human counterpart, ABCA8. In their study published in the **Journal of Lipid Research**, the investigators genetically engineered mice with no ABCA8b in their brains. The absence of this protein reveals the importance of myelination. Their genetically engineered mice had abnormally shaped myelin and decreased speed of signals going through the nerves, and this manifested in irregular movement and even decreased amounts of the myelin producers — oligodendrocytes and Schwann cells. The observed abnormal movement stems from the brain region most damaged by demyelination, the cerebellum. With critical roles in movement coordination, cerebellum demyelination has grave consequences, such as MS.

Because the absence of ABCA8b translated to abnormal movements as seen in MS, the authors hope drug targets that increase this protein could lead to new therapies for people with myelin disorders.

DOI:10.1016/j.jlr.2021.100147

— Clementine Adeyemi

specifically recognize and bind ubiquitin chains are central to signaling, yet researchers know little about their characteristics. In a new paper in the journal **Molecular & Cellular Proteomics**, Mark Villamil, Weidi Xiao and colleagues from the University of California, Irvine identify a ubiquitin interacting motif-like, or UIML, domain and describe its specific binding.

The researchers used biolayer interferometry, pull-down assays, and mass spectrometry to determine that the UIML domain in the yeast transcription factor Met4 specifically binds to K48-linked ubiquitin chains, which are the most abundant chain type. They then designed a probe to mimic the binding and tested its ability to specifically bind to K48-linked polyubiquitin chains on proteins in yeast and mammalian cells. The probe worked, helping the researchers identify proteins with this specific modification.

These results further our understanding of ubiquitin signaling and provide a new reagent to study ubiquitylation across the proteome.

DOI: 10.1016/j.mcpro.2021.100175

The full scope from one scoop

We all have to go — yet most of us give no further thought to our fecal matter after it's flushed. What if some good can come from the go? A group of scientists at the Army Medical University in Chongqing, China, decided to find out.

In their study published in the **Journal of Lipid Research Methods**, Jiangang Zhang, Shuai Yang and colleagues devised a method that profiles fatty acids in fecal matter and tested this separation technique on fecal samples of patients

with hepatocellular carcinoma. This new method has promise for potential diagnostics.

That's because existing methods for diagnosis often are invasive — especially in the case of cancer. Imagine going under the knife to determine if an organ is cancerous and even if it's not, the patient is left with a scar.

The researchers' method involves the use of LC–MS, which combines liquid chromatography, a technique that physically separates the fatty acid components in the fecal samples, with mass spectrometry analysis, which quantifies the fatty acid types found in the samples.

With a protocol that is high throughput, meaning large batches of samples can be processed, yet with no compromise of sample integrity, this new technique likely will translate widely in disease diagnostics.

DOI: 10.1016/j.jlr.2021.100143

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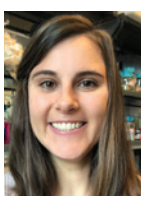


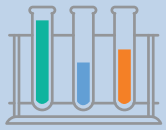
Upcoming ASBMB events and deadlines

MARCH

1	Undergraduate Research Award deadline
1	Student Chapter Outreach Grant spring deadline
1–4	**Deuel conference on lipids**
8	ESCRT biology early registration deadline
8	Women's History Month Twitter chat
9–27	Certification Exam administration
15	ESCRT biology abstract deadline
16	Insider perspectives: Preparing for graduate school and beyond webinar
18	ASBMB annual meeting advance registration deadline

APRIL

	National Minority Health Month
	National Parkinson's Awareness Month
2–5	**ASBMB annual meeting**
19	ESCRT biology regular registration deadline
25	*DNA Day*
26	O-GlcNAc conference abstract deadline
27	Lipid Research Division monthly webinar



MAY

	Arthritis Awareness Month
	National Osteoporosis Awareness and Prevention Month
8–14	*National Women's Health Week*
9	O-GlcNAc conference early registration deadline
10	*National Lipid Day*
16	Mass spectrometry in the health and life sciences abstract submission deadline
17–20	**ESCRT biology conference**

ASBMB

What's with Wikipedia and women?

Things are changing, little by little, at the open-source encyclopedia

By Laurel Oldach

Rajini Rao found the Wikipedia article about herself by accident. "I was sort of flattered," she said. "It was remarkably detailed. I was like, 'Somebody read my thesis?'"

But a few months later, the physiologist found a banner across the top of the page, indicating that a volunteer contributor to the encyclopedia had expressed doubt about her academic notability.

Rao, a full professor at Johns Hopkins School of Medicine, said the comments stung. "I'd rather not have a wiki page than have a page and then some banner across it saying, 'Hmm, this person is suspect; they're an imposter.'"

Eventually, after some conversation among Wikipedia's editors, the banner was removed. But the question about whether Rao's work was important enough to rate an entry in the world's largest general-interest encyclopedia mirrors many skirmishes about notability. Social scientists say that these conversations focus disproportionately on women, and they get at issues of bias, sexism and society that the Wikipedia community is trying to resolve.

The encyclopedia, which celebrated its 20th anniversary last year, is visited by 1.5 billion unique devices every month. It distributes information even further via voice assistants, Google reference cards, and technologies that mine its vast database for information and for natural language patterns.

The gender gap

What trivial question have you asked Alexa, Siri or Google recently? Odds are, the virtual assistant pulled part of its answer from a Wikipedia article. The encyclopedia, which celebrated its 20th anniversary last year, is visited by 1.5 billion unique devices every month. It distributes information even further via voice assistants, Google reference cards, and technologies that mine its vast database for information and for natural language patterns.

A massive volunteer effort and huge donations of time and scholarship are needed to keep the project running and up to date. In addition to the Wikimedia Foundation, which provides servers, software and other infrastructure to run encyclopedias and databases in dozens of languages, the English-language Wikipedia project has about 120,000 active contributors, who call themselves Wikipedians, and 1,000 volunteer administrators.

But significant gaps exist in the coverage. When last surveyed a decade ago, about 85% of English Wikipedia's editors were men. Most lived in the U.S., the U.K. or

MADANSCIENTIST/WIKIMEDIA COMMONS

Rajini Rao

WIKIMEDIA FOUNDATION

ZMCCUNE/WIKIMEDIA

Attendees of the 2016 Wikimedia conference included co-Wikimedians of the Year Emily Temple-Wood (left) and Rosie Stephenson-Goodknight (third from left).

WIKIMEDIA COMMONS

Jess Wade

India. And of the roughly 1.8 million biographies they jointly have produced, at least four out of every five is about a man.

The encyclopedia's gender imbalance is hardly news; the Wikimedia Foundation has acknowledged a problem since that 2011 survey, and efforts to change things have received a great deal of media attention. Wikipedian Rosie Stephenson–Goodknight co-founded a project called Women in Red to write articles about women mentioned in encyclopedia articles on other topics; the project has created over 175,000 articles in five years.

Similar efforts have focused specifically on women scientists. In 2016, Stephenson–Goodknight and Emily Temple–Wood jointly were awarded Wikipedian of the Year by Wikipedia co-founder Jimmy Wales in recognition of Women in Red and of Temple–Wood's efforts to write new pages about women in science. More recently, British materials scientist Jess Wade and American bioinformatician Maryam Zaringhalam published a call to action in the journal Nature inspired by the dearth of articles about women in science. Advocacy organizations such as 500 Women in Science have run Wikipedia edit-a-thons focused on including more women in the encyclopedia.

According to Stephenson–Goodknight, who recently was elected to the board of the Wikimedia Foundation, "When editors such as Maryam, such as Jess, such as Emily have a platform and their voice can be heard … that has a significant effect."

For instance, a Wikimedia Foundation researcher demonstrated in a 2017 paper that efforts such as Temple–Wood's Women in Science project can have a dramatic impact on the encyclopedia's coverage gaps and the quality of pages on a topic. Stephenson–Goodnight said, "When you shine a light and talk about a specific topic related to Wikipedia, it has this effect of improving the representation on that topic."

Yet when biographies of women are added, they sometimes are challenged, as Rao's was, over whether these women are important enough to merit coverage in a general-interest encyclopedia. In 2018, when physicist Donna Strickland received the Nobel Prize, Wikipedia had no page about her. An article had once existed — but it was deleted from the encyclopedia by community consensus after a volunteer questioned her notability.

Who writes Wikipedia?

The article on Rao was written by a Wikipedian who goes by the name Microglia145. The contributor's user page is brief and to the point: "I will deliver the unheard stories of notable women in STEM to the public in an unbiased way through Wikipedia."

It's common for contributors to focus on specific topics. According to University of North Carolina sociologist Francesca Tripodi, who studies how communities use the platform, "Wikipedians are a community, but many of them go into different spaces."

Some volunteers specialize in contributing in topic areas they care about — and there are projects organizing volunteer efforts on every topic from soap operas to sports, synthesizers to seamounts, and thousands more. Other volunteers focus on formatting citations, finding open-source images for new articles or checking new articles for problems. Administrators, elected by the community, have special privileges to protect or delete pages, block problem users and remove spam.

Postgraduate student Brianna Bibel has been contributing to pages about biochemistry and women in science on and off since becoming inspired by a news story about Wade in 2018. "In school, people would always (say) 'You don't want to use Wikipedia, because anyone can edit that,'" Bibel said. Until she read about other scientists' editing campaigns, "It didn't really click that 'anyone' means you."

The human behind Microglia145, a medical student named Mackenzie Lemieux, also was inspired by reading about Wade. During early pandemic lockdowns, she began writing an article a day about a woman in science or medicine. In this, Lemieux joined a years-old tradition of Wikipedia reformers, women who focused specifically on redressing the encyclopedia's gender imbalance.

Because it aims to write a general-interest encyclopedia, filled with verifiable facts on notable subjects that are relayed in as neutral a tone as possible, the Wikipedia community has many rules. New editors are apt to run afoul of these rules, especially the ones concerning neutrality; most come to write on topics they're passionate about, and they tend to gush. And biographies are particularly tricky to write.

"One thing you'll learn if you edit Wikipedia is it's easier to do — and make it stick — a biography of a deceased person versus a living person," said academic librarian Laurie Bridges, who has organized numerous themed edit-a-thons.

Articles about living people are simultaneously more likely to be vanity projects and to be targeted in smear campaigns. Prominent figures' pages are locked down to prevent nonfactual contributions. Brand new pages of any type, but especially biographies, are checked rigorously by multiple editors for violations of copyright law, defamation or blatant self-promotion, and signs they were written by writers for hire.

While writing one article a day, Lemeiux received a mix of feedback from more seasoned editors. Several praised her commitment and productivity. Others coached her on writing to Wikipedia's style: Avoid academic titles, such as Dr. Don't copy lists of awards directly from other websites; that may raise copyright infringement concerns. Above all, editors repeatedly recommended, work hard to maintain a neutral point of view, avoiding words like "prominent," "innovative" and "pioneering" that sound

COURTESY OF MACKENZIE LEMIEUX

Mackenzie Lemieux

Because it aims to write a general-interest encyclopedia, filled with verifiable facts on notable subjects that are relayed in as neutral a tone as possible, the Wikipedia community has many rules.

inherently promotional. Several moved pages she had written from the live encyclopedia into a sandbox called draft space until they could be improved. Several others nominated some of Microglia145's pages for outright deletion.

Tripodi, the sociologist, was working on her dissertation when she began to attend edit-a-thons aimed at closing the gender gap. She met many volunteers motivated by the same concerns as Microglia145. She also noticed that many contributors complained about seeing their articles flagged for deletion soon after an edit-a-thon ended — or even, sometimes, while it was ongoing.

"I started thinking, 'Is this happening proportionally?'" Tripodi said. "'Are women being targeted, or are women just seen as less notable subjects, even though they're meeting this threshold for inclusion?'"

She set out to find out.

Deletion discussions

Once a month, working with a software developer, Tripodi scraped a webpage where contributors discuss Wikipedia articles that one or more editors have voted to delete.

When an article is nominated for deletion, it is linked on a page called Articles for Deletion. The community has a week to weigh in. Any editor who is paying attention may make an argument for deleting an article or in its defense.

The conversation, according to Stephenson–Goodknight, focuses on how well an article follows Wikipedia's rules for neutrality, notability, verifiability and reliable sources. Notability — whether a subject is important enough to rate a Wikipedia page — is often the sticking point. And it's a little different for professors than for the general public.

David Eppstein, a computer scientist at the University of California, Irvine, has contributed over 3,000 articles to Wikipedia, including about 2,000 on women in math and science. "When I started editing on Wikipedia, there was much more of an informal (guideline): Does this person stand out above the average professor?" Eppstein said. "Nowadays, it's more formalized in terms of signals of recognition like fellowships or highly cited publications."

The community has come up with metrics for academic notability that focus on scholarly impact; automatic qualifiers include prestigious awards, named chairs and fellowship in honorific societies. Other criteria include high-impact scholarship, which usually is measured by citation indexes, and press coverage of a scientist's work.

"You know and I know that all of these things are loaded with bias and inherent problems within the scientific community," Wade said of the notability guidelines. In addition, because the encyclopedia relies on secondary sources, forbidding editors from doing their own research in the scientific literature, who makes it into the digital pages of Wikipedia is not just up to editors, Wade said. "You can't write a Wikipedia page solely on (a scientist's) academic profile on their university website. You actually need that scientist to be spoken about by other people."

Eppstein said, "There are quite a few women who meet those criteria and are prominent within their research specialty and have received

that kind of recognition, but don't yet have Wikipedia articles." He makes a habit of writing about such people when he happens to know about their research.

He also keeps an eye on the Articles for Deletion page, watching for academics incorrectly placed there — but, he says, there are plenty of cases where deletion is the correct outcome. "Oftentimes articles are created for people who, really, the world is not ready for an article for them yet. They're working, they're doing good stuff, but they're not at that level of prominence yet."

When an article is nominated for deletion, the discussion lasts a week. After the community reaches consensus — determined not by numerical vote but by how well contributors defend an article's adherence to Wikipedia's guidelines — an administrator acts to close the discussion and either delete a page or keep it and archive the concerns.

Tripodi, studying these issues, monitored the Articles for Deletion page for more than three years, building a data set she could use to test what she had observed qualitatively at edit-a-thons, that articles about women were more likely to be nominated for deletion than articles about men. She also kept an eye on the outcomes of those conversations.

Over time, she saw a pattern play out. The 22,000 biographies that landed in Articles for Deletion conversations were disproportionately likely to be about women. But pages about women were more likely than pages about men to be retained after discussion. She called these miscategorized.

"They met the criteria for inclusion at a point where they shouldn't have been (on the Articles for Deletion list) to begin with," she said. "If there weren't networks like Women in Red devoted to saving these articles, these articles would have been deleted."

Saving pages

Some academics described the process of discussing articles for deletion as invigorating, similar to responding to peer reviewers. However, Tripodi said, many others find it demoralizing.

In the summer of 2020, Lemieux wrote an article on psychologist Ayana Jordan, a clinician–researcher who directs a research center at Yale and had been in the news a lot discussing the mental health impacts of the pandemic and systemic racism. As she usually did, Lemieux tweeted about the new article. Responses were positive; Jordan herself was involved in the conversation.

The problems began when Twitter users, clicking through, noticed the article was flagged for deletion. The editor who had nominated it wrote, "Assistant professor … who does not meet the notability standard for academics or (general notability guidelines). The article itself is promotional and CV like."

Lemieux's Twitter followers were indignant. One or two pointed out that this happens a lot with new Wikipedia pages describing women in STEM, especially women of color (Jordan is Black). Several, aware that anybody can edit Wikipedia, made their own accounts just to join the discussion page, weighing in in favor of retaining the article.

This behavior annoyed established Wikipedians. Several commenters on the page pointed out that the system, while based in community discussion of the encyclopedia's rules and guidelines, is not meant to operate as a democracy. The administrator

Changes at Wikimedia

According to Rosie Stephenson–Goodknight, founder of the Wikipedia project Women in Red and, since October 2021, a member of the Wikimedia Foundation's board of trustees, the organization is in the midst of many changes.

Based on recommendations from the community, late in 2020 the board rolled out a universal code of conduct for contributors, banning harassment and information vandalism and underlining the importance of mutual respect within the Wikipedia community. Early this year, new CEO Maryana Iskander took over at the Wikimedia Foundation after a two-month listening tour with Wikipedians from around the world.

"We are in a very exciting time here," Stephenson–Goodknight said. She noted that dozens of new initiatives are underway. "Some of them are going to start at the foundation; some of them are going to start within one community, (or) in communities working together to form hubs and move something forward. So keep an eye on what we're doing."

A JOHNSON/WIKIMEDIA COMMONS

A photo illustration created for the 2020 event WikiHerStory, which the Wikimedia foundation organized during women's history month to promote inclusion of women's history in the encyclopedia, shows contributor Jess Wade, one of three WIkipedians who were highlighted as part of the project.

who closed the discussion wrote, "This discussion suffered greatly from outside canvassing. This always makes the task difficult for a closer (of the discussion), but rarely has the desired effect."

The page was deleted.

"It's pretty disheartening, after you've spent so much time writing a page, to have it deleted," Lemieux said. She also said that Wikipedia administrators discussed on the Jordan discussion page banning her as a user over recruiting outsiders to stuff the ballot box, which she maintains she did not do.

Skirmishes over academic notability happen regularly, though they don't usually involve outsiders. Wikipedians argued over astrophysicist Katie Bouman, who became famous when she was photographed reacting to the first-ever image of a black hole; although she became the media face of a 400-physicist team, Slate reported at the time that some editors argued that her scholarly impact did not warrant an article of her own and she should be folded into the article about the black hole itself. Bouman now has her own page.

Wade and other editors receive a lot of negative attention alongside the positive; some fellow contributors are skeptical about the biographies they choose to write. In a backroom conversation on David Eppstein's user talk page several years ago, one editor posted, "From my perspective, if there are more biographies of women being AfD'd, it's because there are more biographies of non-notable women being created."

Another was more blunt: "Ask Jess Wade to write borderline articles about white male academics, and we can AfD them at ease."

Eppstein argued that responding to Wade's fame by "poring through her hundreds or thousands of article creations looking for weaker articles to nominate … is 100% a bad thing. We have already driven away at least one other productive member of Women in Red by exactly the same tactics."

Wade said her articles aren't flagged so often these days; anyway, when they are, she likes the challenge of defending them. "I quite enjoy (it). You know when you get comments from peer review, and you're like, 'Ha! I can take you on'? I quite like that."

Lemieux said that the argument over Ayana Jordan didn't impact her motivation as an editor. But it did suggest a next project that intrigued her.

"After I reached 100 pages, I decided to dedicate my time to exploring the extent of racial and gender bias in Wikipedia, specifically for women in STEM," Lemieux said. She and a friend, Rebecca Zhang, reached out to Tripodi, whose paper had been published in the journal New Media and Society, in July 2020.

Working with Tripodi, Lemieux and Zhang designed a study to test the impact of Google hits, which administrators often use as a quick

CONTINUED ON PAGE 34

Just how representative is Wikipedia today?

To measure representation of prominent scientists on Wikipedia, ASBMB Today analyzed a list of the 1,052 researchers inducted into the American Association for the Advancement of Science in 2021 and 2022. AAAS membership is one way to meet the encyclopedia's notability threshold.

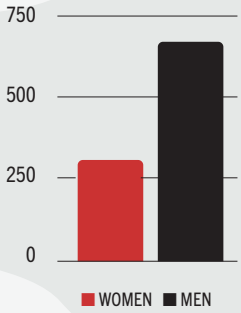
The two years' worth of AAAS fellows included almost twice as many men (676) as women (376). However, a higher proportion of women in the data set (40%) had Wikipedia articles than men (28%) as of January 2022. A small number of prolific page creators, including Jess Wade and David Eppstein, accounted for the majority of the difference in pages about this group of scientists.

The date of article creation also shows the impact of activist editors. From 2002 to 2017, the number of new articles about men in this cohort fluctuated, but each year they outnumbered new articles about women in the cohort. From 2019 onward, the number of new articles about women in the cohort outstripped new articles about men.

Visit github.com/Laurel-O/wikipedia.git for more information on how these data were collected.

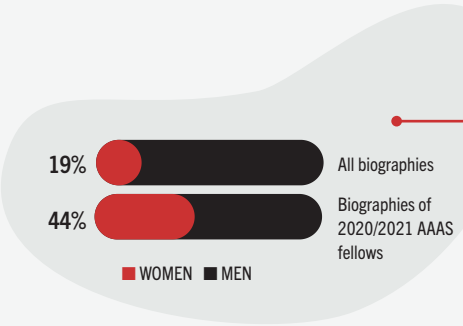
A group of notable scientists

Just over 1,000 scientists were elected as AAAS fellows in 2020 and 2021. Two out of every three of them were men.



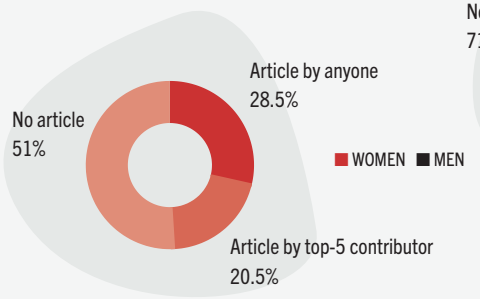
Scientists buck the trend

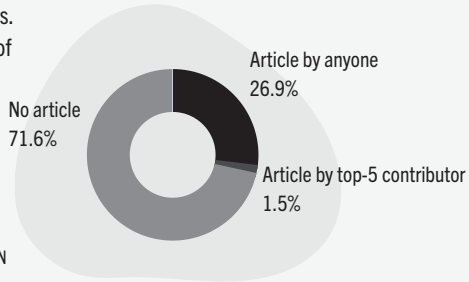
Across Wikipedia, just 19% of biographies are **about women**. But 44% of biographies of 2020 and 2021 AAAS fellows are about women. Many were written by a small number of Wikipedia editors, including Jess Wade and David Eppstein.



Prolific page creators

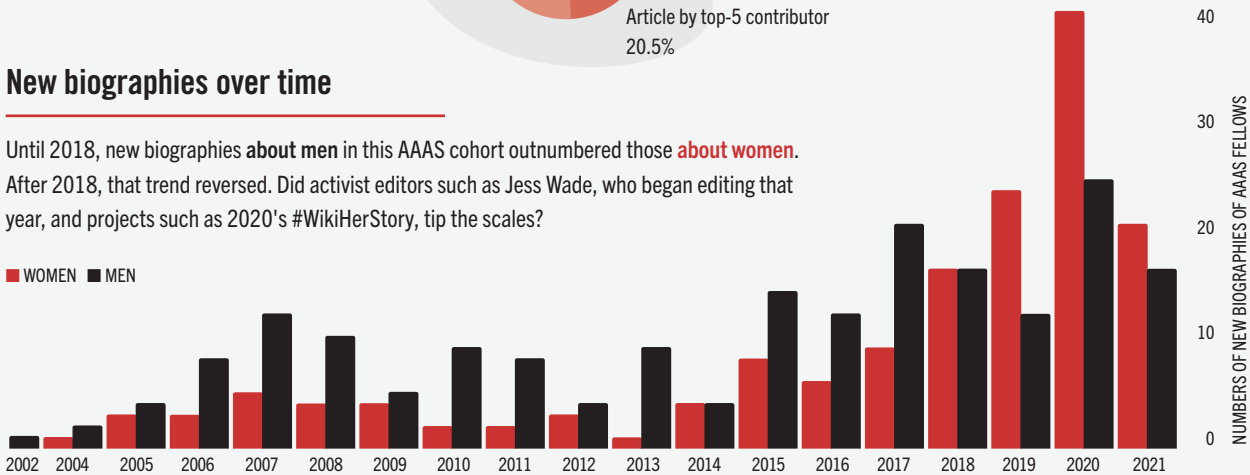
Roughly **half of the women** and **a quarter of the men** in the two AAAS classes have Wikipedia biographies. Five contributors of new articles account for most of that difference.





New biographies over time

Until 2018, new biographies **about men** in this AAAS cohort outnumbered those **about women**. After 2018, that trend reversed. Did activist editors such as Jess Wade, who began editing that year, and projects such as 2020's #WikiHerStory, tip the scales?



> "There needs to be more research about specific areas where bias exists … and how we can begin to improve it."
>
> MACKENZIE LEMIEUX

CONTINUED FROM PAGE 32

proxy for notability when weighing whether to nominate an article for deletion. Their study has yet to be peer reviewed, but Lemieux said that among the male subjects of articles nominated for deletion, search notability is a decent predictor of whether the deletion goes through. "But that's not the case for white women, or men or women of color."

"Wikipedia, in good faith, intentionally tried to keep some subjectivity in terms of how to apply (notability) criteria, because they weren't sure what would matter," Lemieux said. But that subjectivity, she said, has left the door open for societal biases to factor into how pages are assessed. "There needs to be more research about specific areas where bias exists … and how we can begin to improve it."

"If you're looking at inequality as like peeling back the layers of an onion," Tripodi said, "the first layer is that … women don't get hired for those positions." Second? "We're in those positions, but we don't really get recognized — we don't get covered by the media, or we don't get books written about us." And third: "There's this tiny subset of women who are getting hired and are getting things written about them — but then aren't able to stick on this resource."

The article on Rajini Rao that Lemieux created was flagged for notability (although not nominated for deletion) in the summer of 2021, about a year after Lemieux stopped editing. When Rao noticed the banner at the top of the page, she too took to Twitter. "I was like, What is this? Can anyone help me? Does anyone know what to do?" she said. "And it was just a wonderful experience."

Wikipedia editors, including Wade, marshaled arguments in support of Rao's prominence; a friend in Spain, who Rao said is not even a scientist, logged in to post about how much higher Rao's h-index was than the average biologist's. The article remains online.

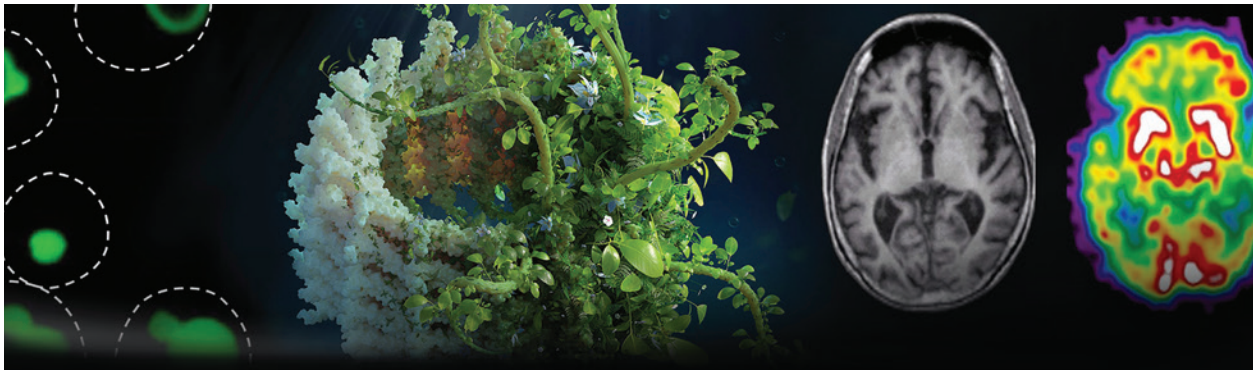
The way forward

In Wade's four years of intensive editing, she said, she and fellow activist editors have learned a lot about working with other factions in the Wikipedia contributor community. "I think that everyone is working toward the same aim. It's just that we need to get to a point where the old-school editing community recognizes that there are women who should be there and aren't there, and we recognize that not every single woman who ever existed needs to be on Wikipedia."

In the years since she started writing women into the encyclopedia, it's gotten easier to find sources in medical and scientific journals, and more diverse scientists are winning awards and fellowships. "All this is kind of happening," she said. "And I think my role, our role as people who care about this is to go out and just try and make it happen faster."

Stephenson–Goodknight said, "What all of us, all editors of all genders, can deal with is only those sources that we can find. If society doesn't provide us with sources … what we can't do is go back and change history."

Laurel Oldach (loldach@asbmb.org) is a science writer for the ASBMB. Follow her on Twitter: @LaurelOld.



ESCRT biology

May 17–20 | Madison, Wis.

This multidisciplinary in-person conference will cover all key aspects of ESCRT biology. Attendees will hear (and present) the latest developments in our understanding of the mechanisms, evolution, biology and medical applications of ESCRT pathways in all three kingdoms of life.

asbmb.org/meetings-events/escrt-biology

ASBMB

O-GlcNAc regulation of cellular physiology and pathophysiology

July 7–10 | Athens, Ga.

The in-person conference will draw experts from around the world to discuss how O-GlcNAc and O-GlcNAc cycling enzymes modulate protein function in basic biological processes as well as in disease states, including diabetes, cancer, cardiovascular disease and neurological diseases.

asbmb.org/meetings-events/o-glcnac-regulation

ASBMB

How does the sugar O-GlcNAc regulate intracellular proteins?

A summer meeting organized by leaders in the field will explore this question

By Nuala Del Piccolo

> "It took us about a year before I believed the results, because it was so surprising to see the monosaccharide added to proteins inside the nucleus and cytoplasm rather than outside the cell."
>
> JERRY HART

In July, scientists from around the world will gather at the University of Georgia's Complex Carbohydrate Research Center to discuss how post-translational modification with the monosaccharide O-linked N-acetylglucosamine, or O-GlcNAc, regulates nuclear and cytosolic proteins.

The meeting, titled "O-GlcNAc regulation of cellular physiology and pathophysiology," is co-organized by two professors at the University of Georgia: Gerald "Jerry" W. Hart and Lance Wells.

ASBMB Today recently spoke with Hart and Wells about the field of O-GlcNAc biology and the upcoming meeting. The interview has been edited for length, style and clarity.

How did you each become interested in O-GlcNAc biology?

Hart: Do you want me to start, Lance?

Wells: Since you discovered the field, that's probably a good idea.

Hart: So, we discovered O-GlcNAcylation in 1983 when we were probing cells of the murine immune system with bovine milk galactosyltransferase as a way to detect terminal GlcNAc residues on living cells. It took us about a year before I believed the results, because it was so surprising to see the monosaccharide added to proteins inside the nucleus and cytoplasm rather than outside the cell.

It took a few years before my lab really started working on O-GlcNAc in earnest, but it's been our primary focus for the last three and a half decades. In that time, our group and many others have shown that it's a nutrient sensor that detects glucose and other nutrients and subsequently modifies proteins. It's involved in virtually everything the cell does, including transcription, translation and mitochondrial function; as a result, it's directly involved in diseases of aging — like diabetes, cancer and Alzheimer's.

HART

Wells: It was the mid-to-late 1990s, and I was doing my Ph.D. at Emory University studying galactosemia and sugar nucleotide metabolism. At that time, the field of signal transduction was really taking off. I was asking myself, What am I going to study for my postdoc? And how can I be involved in the signal transduction field and still think about how cells respond to nutrient metabolism?

WELLS

I stumbled across O-GlcNAc, which was still pretty new, and

decided that if I was going to do a postdoc, I might as well work with the person who discovered the modification. I interviewed for a postdoc with Jerry, got the position and joined his lab at Johns Hopkins School of Medicine for five years. After that, I set up my own shop here at the University of Georgia; we work on O-GlcNAc and other O-glycans involved in human disease.

Why did you decide to co-organize a meeting focused on O-GlcNAc regulation?

Hart: Right now, over 8,000 proteins are known to be modified by O-GlcNAc, and that number gets bigger and bigger every day. This meeting will cover large areas of biology, all focused on how cycling this sugar modification regulates various things in biology. There have been one or two other international meetings on this topic, but nothing at the scale we're planning, so we're very excited. We've invited the top people in the field to come to Georgia. I think we will learn a lot, and I think the meeting will advance the field.

Wells: We're both really excited about this meeting. We're bringing in people who have expertise in various areas, because O-GlcNAc is similar to phosphorylation in that if someone said, "What does phosphorylation do?" that's not a simple answer. It's all context dependent. Unlike phosphorylation, there's only a single enzyme that puts O-GlcNAc on and a single enzyme that takes it off, which makes thinking about regulation of this modification really fascinating. Additionally, the O-GlcNAc field has really taken off recently due to people studying some other biological phenomenon running into O-GlcNAc; we are targeting those people with this meeting.

The meeting, "O-GlcNAc regulation of cellular physiology and pathophysiology," will be held in July at the University of Georgia's Complex Carbohydrate Research Center.

What sessions are you most excited about?

Hart: All of them, frankly! We're not covering all the topics that O-GlcNAc is directly involved in, but we are inviting people that we think are doing the most exciting work in the field. We're starting out with fundamentals and then going into the biology. What are the functions of O-GlcNAc and can you understand them at the site level?

Wells: We're going to start off talking about the cycling enzymes — O-GlcNAc transferase and O-GlcNAcase — which still aren't well understood, so I'm really excited about this first session. Then we're going to go into the most well-documented functional roles of O-GlcNAc: regulation of gene expression and of metabolism. Finally, we're going to shift over to pathophysiology — and based on my background studying disease, this is really exciting to me. We're going to look at the role of O-GlcNAc in immunity, cancer, and neuronal function and disease.

> "We're bringing in people who have expertise in various areas, because O-GlcNAc is similar to phosphorylation in that if someone said, 'What does phosphorylation do?' that's not a simple answer. It's all context dependent."
>
> LANCE WELLS

More about the meeting

The O-GlcNAc regulation of cellular physiology and pathophysiology meeting will be held July 7–10 at the University of Georgia in Athens. The abstract deadline is April 26. The early registration deadline is May 9. The final registration deadline is June 6. Below is a list of speakers.

Michael Boyce, Duke University

John Chatham, University of Alabama at Birmingham

Alberto Fernández–Tejada, CIC bioGUNE

John Hanover, National Institute of Diabetes and Digestive and Kidney Diseases

Olof Lagerlöf, Umeå University

Tony Lefebvre, University of Lille

Brian Lewis, National Cancer Institute

Richard Meek, University of York

Stephanie Olivier–Van Stichelen, Medical College of Wisconsin

Matthew Pratt, University of Southern California

Parameswaran Ramakrishnan, Case Western Reserve University

Mauricio Reginato, Drexel University

Chad Slawson, University of Kansas Medical Center

Priya Umapathi, Johns Hopkins Medicine

David Vocadlo, Simon Fraser University

Christina Woo, Harvard University

Natasha Zachara, Johns Hopkins Medicine

What current challenges in the field do you hope to address at the meeting?

Hart: It's actually a very difficult field: You have to be knowledgeable about not only biochemistry but also glycobiology and specific analytical methods like advanced mass spectrometry. There aren't a lot of tools available to study O-GlcNAcylation; in particular, site-specific antibodies are very rare and hard to make because of the small size of the sugar.

Additionally, the experimental methods we have change O-GlcNAcylation on all 8,000 proteins simultaneously, which makes it a little hard to figure out the biology. We need methods to change O-GlcNAcylation one protein — or even one site — at a time. It's challenging but also very exciting.

Wells: One of our goals for this meeting is to welcome people new to the field of O-GlcNAc regulation. Nearly half of all the talks are going to come from abstract submissions. A lot of the invited speakers are the who's who of the field, which is great for new investigators because they're going to get the opportunity to interact with these researchers in an intimate setting, to develop collaborations, to find out whose lab has which tools, and to discuss the strengths and weaknesses of certain protocols. Distributing this information and more will help the field move forward and will welcome new people to the field.

What tips do you have for submitting abstracts?

Hart: I always tell young people: If you're going to work on something, work on something important and interesting to you. And I give the same advice about writing abstracts: Try to convey why the subject is interesting to you and why other people should find it interesting.

Wells: I would follow up with that and say, "What is the gap in knowledge that you're trying to fill, and why is that important?" And one of the things I always tell my students in is to let your enthusiasm come across in your abstract. This isn't a manuscript publication that needs to be formal.

Is there anything else you'd like prospective attendees to know about the meeting?

Hart: It's going to be a lot of fun! We're going to have good social interactions, since it's still a relatively small field. It's going to be a really nice time to get together with colleagues and share your trials and tribulations. And, I have to say, Athens, Georgia is a really nice place — it's a pure college town, the weather here is great, and it's easy to get around.

Wells: I think it's important to mention — especially for people coming to O-GlcNAc regulation from a glycobiology perspective — that we're going to have the meeting at the Complex Carbohydrate Research Center, which is probably the largest concentration of glycobiologists in the world — definitely in the United States. It's a beautiful, 144,000-square-foot building where everybody does glycobiology and knows what the blue square means. We all talk the same language, and that's really useful. *(Author's note: In the symbol nomenclature, the blue square represents GlcNAc.)*

Nuala Del Piccolo (nualadp.phd@gmail.com) is a scientific writer in the biomedical engineering department at the University of California, Davis. She earned her Ph.D. in materials science and engineering at Johns Hopkins University.

2022 JBC/Tabor award winners announced

By George N. DeMartino

The American Society for Biochemistry and Molecular Biology annual meeting in Philadelphia in April will feature four special spotlight talks by winners of the Journal of Biological Chemistry/Herbert Tabor Early Career Investigator Awards. All are first authors of standout JBC papers published in the previous year.

The awards are named for the late Herb Tabor, who served as JBC's editor-in-chief from 1971 to 2012 and upheld the journal's mission to support the dissemination of science, enhance research visibility and promote scientific equity.

A committee of JBC associate editors selected six award-winning first authors after carefully reviewing nominations from JBC readership, consulting experts in the field, and evaluating the scientific quality and impact of nominated papers.

Alex Toker, editor-in-chief of JBC, said, "We are happy to recognize these early-career investigators who have contributed significant research to the journal. They represent the next generation of innovators and researchers in biological chemistry."

The winners of the 2022 Tabor awards, listed here, will give talks on their award-winning papers at 3:30 p.m. Sunday, April 3, at the ASBMB annual meeting.

Jacob B. Rowe is a doctoral student at the University of Miami Miller School of Medicine. His paper is titled "The evolution and mechanism of GPCR proton sensing."

Jodi Brewster is an associate research fellow at the University of Wollongong. Her paper is titled "Structures and kinetics of Thermotoga maritima MetY reveal new insights into the predominant sulfurylation enzyme of bacterial methionine biosynthesis."

Armin Bayati and **Rahul Kumar** are graduate students at McGill University and are joint first authors. Bayati will give a talk on their paper titled "SARS-CoV-2 infects cells after viral entry via clathrin-mediated endocytosis."

Calvin J. Gordon is a graduate student at the University of Alberta. His paper is titled "Molnupiravir promotes SARS-CoV-2 mutagenesis via the RNA template."

The sixth winner, **Julianty Frost**, a research associate at the University of Liverpool, is on maternity leave and will present her work at the 2023 ASBMB annual meeting. Her paper is titled "Von Hippel–Lindau small-molecule inhibitor binding increases stability and intracellular levels of VHL protein."

JBC/Herbert Tabor Early Career Investigator Winner Spotlight Talks

Sunday, April 3

3:30 pm

Pennsylvania Convention Center, Philadelphia

George N. DeMartino (George.DeMartino@UTSouthwestern.edu) is a professor of physiology at the University of Texas Southwestern Medical Center and a Journal of Biological Chemistry associate editor.

JBC/TABOR AWARD WINNER

Focusing on a field, then diversifying skills

By Nuala Del Piccolo

Growing up in New Zealand, Jodi Brewster was fascinated by her older sister's descriptions of high school–level science. "I just couldn't wait to be there and learning it for myself," she said. "I would be reading her books and trying to understand her notes."

After dabbling in physics, chemistry and biology during high school, Brewster enrolled at University of Otago. She knew she wanted to study science but struggled to settle on a discipline. "I couldn't choose between chemistry and biology, so I was like well, why not both?" she said. She settled on biochemistry, "not really understanding it isn't just biology plus chemistry; it's a little bit of its own discipline."

Brewster earned her Ph.D. in biochemistry from the University of Otago. Her thesis identified and characterized a protein responsible for carotenoid binding and transport in sea urchin gonads. "When I finished my Ph.D., it wasn't really a convenient time for me to go overseas," she said. "My husband was in a good place in his career, so we decided to stick around for a few years."

Brewster completed a series of short postdoctoral appointments at the University of Otago, during which funding dictated the focus of her research. She also worked part time as a medical writer. She said that switching projects so frequently diversified her technical skills and expanded her knowledge of experimental systems, biochemistry and structural biology.

Now a postdoctoral associate research fellow at the University of Wollongong, Brewster studies enzymes involved in viral DNA replication using structural biology. She also supervises students and delivers lectures.

JODI BREWSTER

Kinetic and structural characterization of the enzyme MetY

Methionine, an essential amino acid, is synthesized in bacteria via either trans-sulfurylation or direct sulfurylation. The latter route is more common but not well studied relative to the former.

The enzymes that catalyze trans- and direct sulfurylation are homologs thought to be derived from a common ancestor. "What's really fascinating about the three modern homologs is that the root mean square deviation if you overlay the structures is around two Ångströms across 450 or so amino acids, which is nuts," Jodi Brewster said. "And the active site residues are also highly conserved. Yet the sequence identity is less than 40%. Even more interesting is that the enzymes can't cross-react."

In a 2021 Journal of Biological Chemistry article, Brewster and colleagues characterized the kinetics and structure of a MetY enzyme from the anaerobic bacterium Thermotoga maritima that catalyzes direct sulfurylation. Their results provide clues about how sulfurylation enzyme homologs achieve specificity.

Their kinetic activity data demonstrated that MetY processes the direct sulfurylation substrate about a thousandfold more efficiently than the trans-sulfurylation substrate.

The team also obtained X-ray crystal structures of MetY alone and bound to a reaction intermediate. Through close analysis of the enzyme's active site and computational molecular docking, the team discovered that the identity of residue 270 may regulate which sulfurylation substrate can bind to the active site, providing a basis for enzyme specificity.

Brewster hopes one day to lead her own research group, which would build on the results of this study.

Nuala Del Piccolo (nualadp.phd@gmail.com) is a scientific writer in the biomedical engineering department at the University of California, Davis. She earned her Ph.D. in materials science and engineering at Johns Hopkins University.

JBC/TABOR AWARD WINNER

The benefits of being an open-minded skeptic

By Brian O'Flynn

A common thread in Jacob Rowe's academic path has been the development of strong scientific principles coupled with a creative flair and open-mindedness.

A B.S. in chemistry from East Carolina University garnered Rowe a toolkit of knowledge but little research experience. A subsequent M.S. at the University of North Carolina Wilmington under the watchful eye of Ying Wang was his introduction to research and where he developed his scientific fundamentals.

Switching to molecular and cellular pharmacology in pursuit of a Ph.D. at the University of Miami landed Rowe in the lab of Dan Isom, a former fine arts major and practicing pharmacologist and biophysicist.

"Dan has always been good at the innovation side of things," Rowe said. "He likes to stay with the latest and greatest techniques."

In Isom's lab, Rowe was encouraged to develop his more creative instincts. "There's a lot of value in being creative in science," he said. "You can really expand the type of scientist you are."

Rowe discovered that a creative flair could function well with the skepticism of a scientist when he began pursuing the concept of proton sensing in G protein–coupled receptors, or GPCRs. Driven by a hypothesis developed with the help of Isom's informatics platform pHinder (pronounced "finder"), Rowe was tasked with identifying whether a buried cluster of charged residues functioned as a proton sensor for a particular group of GPCRs.

This went against some previously published data suggesting extracellular histidines performed this role. Rowe was skeptical of both, pushing himself tirelessly to confirm beyond a doubt that the lab had, in fact, uncovered a novel mechanism for proton sensing in GPCRs.

"The hypothesis just held up all the way through," he said. "I learned to believe in the power of computational biology."

JACOB ROWE

Overlooked buried triad responsible for GPCR proton sensing

G protein–coupled receptors function by relaying extracellular signals into intracellular downstream responses. This process can be complex, with multifaceted functional behavior noted for many different GPCRs.

One such nuance lies in the ability of a subgroup of three GPCRs (GPR4, GPR65 and GPR68) to function in response to their local pH — so-called proton-sensing GPCRs. Their discovery came with hypotheses of mechanism, but these never were explored in depth until Rowe and his colleagues set out to do just that.

The team probed for residues that are likely contributors to proton sensing using the informatics program pHinder. This identified a triad of buried acidic residues, two aspartic acids (referred to as the DyaD) and a glutamic acid (the apEx), spatially conserved across all three proton-sensing GPCRs. A profiling scheme was developed based on CRISPR-generated libraries of GPCR variants and was combined with GPCR assays to explore the contribution of these residues to the mechanism and evolution of proton sensing in GPCRs.

Their results, as described in a paper in the Journal of Biological Chemistry, confirmed that the triad directly regulates pH sensing. But how does this work? pH titrations in the presence and absence of sodium showed that at high pH, a Na^+ ion functions to stabilize the DyaD. A drop in pH leads to protonation and subsequent activation of the receptor. Phylogenetic analysis showed the evolutionary lineage of the triad and pointed to new avenues of biological inquiry.

Brian O'Flynn (Brian.OFlynn@stjude.org) is a postdoctoral research fellow at St. Jude Children's Research Hospital in Memphis.

JBC/TABOR AWARD WINNER

Deciphering antiviral mechanisms during a pandemic

By Nicole Lynn

At the onset of the COVID-19 pandemic, many research groups pivoted their focus to the development and understanding of drugs that could be used to combat the deadly virus SARS-CoV-2. When Calvin Gordon joined Matthias Götte's lab at the University of Alberta, Canada, his initial goal was to study the inhibition of RNA dependent RNA polymerases, enzymes that are responsible for replication in viruses like Ebola, influenza and severe acute respiratory syndrome, or SARS.

Gordon first discovered his passion for research during the last two years of undergraduate study at Mount Royal University of Calgary, Alberta. Before entering his first year of graduate study, Gordon was encouraged by a friend and fellow U of A graduate student to seek professor Götte due to their aligning research interests. Gordon found the lab to be a perfect fit.

In March of 2020, as a consequence of the pandemic, Gordon's focus shifted to understanding the mechanisms behind broad-spectrum antivirals such as remdesivir and molnupiravir. His research led to the publication of a paper in the Journal of Biological Chemistry detailing the mechanism of molnupiravir's interaction with SARS-Cov-2 on a molecular level.

Like many scientists performing essential research at the height of the pandemic, Gordon found the experience to be stressful yet humbling.

"It was a weird and mentally taxing experience for sure," he said. "We were fortunate, being able to go into the lab and maintain a routine with our research — not many people could do that."

Gordon is working toward his Ph.D. in medical microbiology and immunology at the University of Alberta and enjoying every minute. "My favorite part is being at the bench, running assays," he said. "I pinch myself most days because I get to come into the lab and work with incredible people."

When asked about his future, Gordon said that he hopes to recognize where the opportunities are and make the most of them.

How molnupiravir works against COVID-19

Molnupiravir is a broad-spectrum antiviral drug that first was approved in the U.K. in November 2021 and later won emergency approval in the U.S. to treat SARS-CoV-2 viral infection in adults.

Early in the pandemic, Calvin Gordon and others in Matthias Götte's lab became interested in understanding how antivirals like molnupiravir work against SARS-CoV-2. The lab's previous experience researching coronaviruses such as Middle East respiratory syndrome, or MERS, allowed them to begin evaluating drugs designed to combat SARS-CoV-2.

CALVIN GORDON

The researchers found that molnupiravir interferes with the viral replication cycle. Here, the drug can serve as a substrate for viral RNA polymerases, which are enzymes that are responsible for replicating the viral genome. When molnupiravir is incorporated into the viral RNA, depending on where it is incorporated, the resulting mutation will inhibit synthesis and promote lethal or nonfunctional mutations.

"I hope people can see our research on these antivirals and how understanding their mechanisms provides groundwork for optimizing and developing new antiviral agents." Gordon said.

Nicole Lynn (nalynn@ucla.edu) is a Ph.D. candidate at UCLA and a volunteer writer for ASBMB Today.

JBC/TABOR AWARD WINNER

A research journey spanning three countries

By Nivedita Uday Hegdekar

Studying and working in a foreign country can be an enriching experience. No one understands this better than Rahul Kumar, who has studied in not one but three countries.

Kumar grew up in his native state of West Bengal, India. From a young age, he said, he was interested in understanding the whys behind disease pathologies. This inspired him to pursue a dual bachelor's–master's degree at the prestigious Indian Institutes of Science Education and Research, known as IISER, in Kolkata. There, he majored in biological sciences with a chemistry minor.

"I greatly appreciated how IISER helped me build foundational scientific knowledge and critical thinking," Kumar said.

While he enjoyed scientific learning, Kumar was unsure whether pursuing a Ph.D. would be the right career step. A three-month research internship at the University of Southern California proved to be the turning point. In Jennie Chen's lab, he studied the biosynthesis and cell biology of the protein rhodopsin.

"Dr. Chen gave me the freedom to explore and think creatively," he said. "I got to design experiments to answer different research questions. It was a life-changing experience."

Kumar then joined Peter McPherson's lab at McGill University in Canada as a Ph.D. student. His doctoral work focused on studying the protein DENND5A; mutations in this protein cause epileptic seizures and reduced brain development.

The pandemic presents a research opportunity

The COVID-19 pandemic presented an unexpected collaborative opportunity for Rahul Kumar and a fellow graduate student, Arbim Bayati. Together they investigated the molecular process by which SARS-CoV-2, the causative virus of COVID-19, gains access into cells.

Kumar produced the purified SARS-CoV-2 spike protein (the part responsible for the infectivity of the virus) that Bayati used to determine uptake of this protein by the cell. Simultaneously, Kumar performed infectivity experiments in cells using a SARS-CoV-2 pseudovirus (a harmless, nonreplicating virus in which the surface protein is replaced with the SARS-CoV-2 spike protein).

The researchers found that after engaging with the plasma membrane, SARS-CoV-2 undergoes a molecular process called clathrin-mediated endocytosis to enter the cell. Furthermore, Kumar demonstrated that when clathrin protein was removed, the infectivity of SARS-CoV-2 drastically reduced.

This work uncovered the mechanism by which SARS-CoV-2 enters a cell and demonstrates the importance of this process in viral infectivity. The findings were published in the Journal of Biological Chemistry.

RAHUL KUMAR

Many of his studies were carried out on induced pluripotent stem cells derived from patient samples, Kumar said. "This was particularly exciting, as such findings will have clinical relevance for disease treatment."

Kumar has collaborated on other projects, one of which earned him a Journal of Biological Chemistry Tabor award. He is on track to defend his Ph.D. next fall and plans to pursue postdoctoral research.

"I have learned so much in my current lab," he said. "As a result, I feel prepared to step out of my comfort zone and explore newer avenues in cell biology."

Outside the lab, Kumar enjoys participating in teaching opportunities at high schools and hiking with his friends. He has thoroughly enjoyed the experience of living abroad and hopes his next research stint will give him a new location to explore.

Nivedita Uday Hegdekar (nivedita.hegdekar@gmail.com) is a graduate student at the University of Maryland working toward a Ph.D. in biochemistry and molecular biology and an M.S. in patent law. Follow her on Twitter: @NiveditaHegdek1.

JBC/TABOR AWARD WINNER

A passion for the neurological

By Jessica Desamero

Armin Bayati's undergraduate years cemented his dual fascination with biology and the brain.

Bayati earned a bachelor's degree with distinction in biology and psychology at the University of Victoria in British Columbia, where he worked at a medical sciences lab and started doing electron microscopy, a technique used to capture high-resolution images of a variety of specimens, such as cells and biopsy samples. He became intrigued by cellular functions and structures.

At the same time, Bayati worked at Saint Joseph's Hospital as an activity coordinator for patients with neurological disorders, the most common symptom of which was dementia. Witnessing the cognitive decline of these patients got him interested in neuroscience. "A lot of what affects elderly people's independence is neurological disorders such as dementia, Alzheimer's disease, or movement disorders like Parkinson's and Huntington's disease," he said. "So that's where my interest in the neurological aspects of things comes in."

These experiences led Bayati to study the biological mechanisms behind neurodegenerative disorders at a cellular level. Now a Ph.D. candidate at the Montréal Neurological Institute and Hospital at McGill University, he works in Peter McPherson's lab, where his research focuses on alpha-synuclein, a neuronal protein linked to Parkinson's disease and other disorders. He investigates how the pathological form of alpha-synuclein is brought into cells and what type of endocytosis occurs.

Bayati recently has used his expertise in endocytosis to study the virus that causes COVID-19. "We were looking at how pathological alpha-synuclein enters the cell," he said. "The problem with COVID was the same thing. How does the virus enter the cell? It would be the same kind of experiments that we'd do for looking at the internalization of alpha-synuclein, but then I applied it to finding how the spike protein enters the cell."

ARMIN BAYATI

Getting the spike protein into the cell

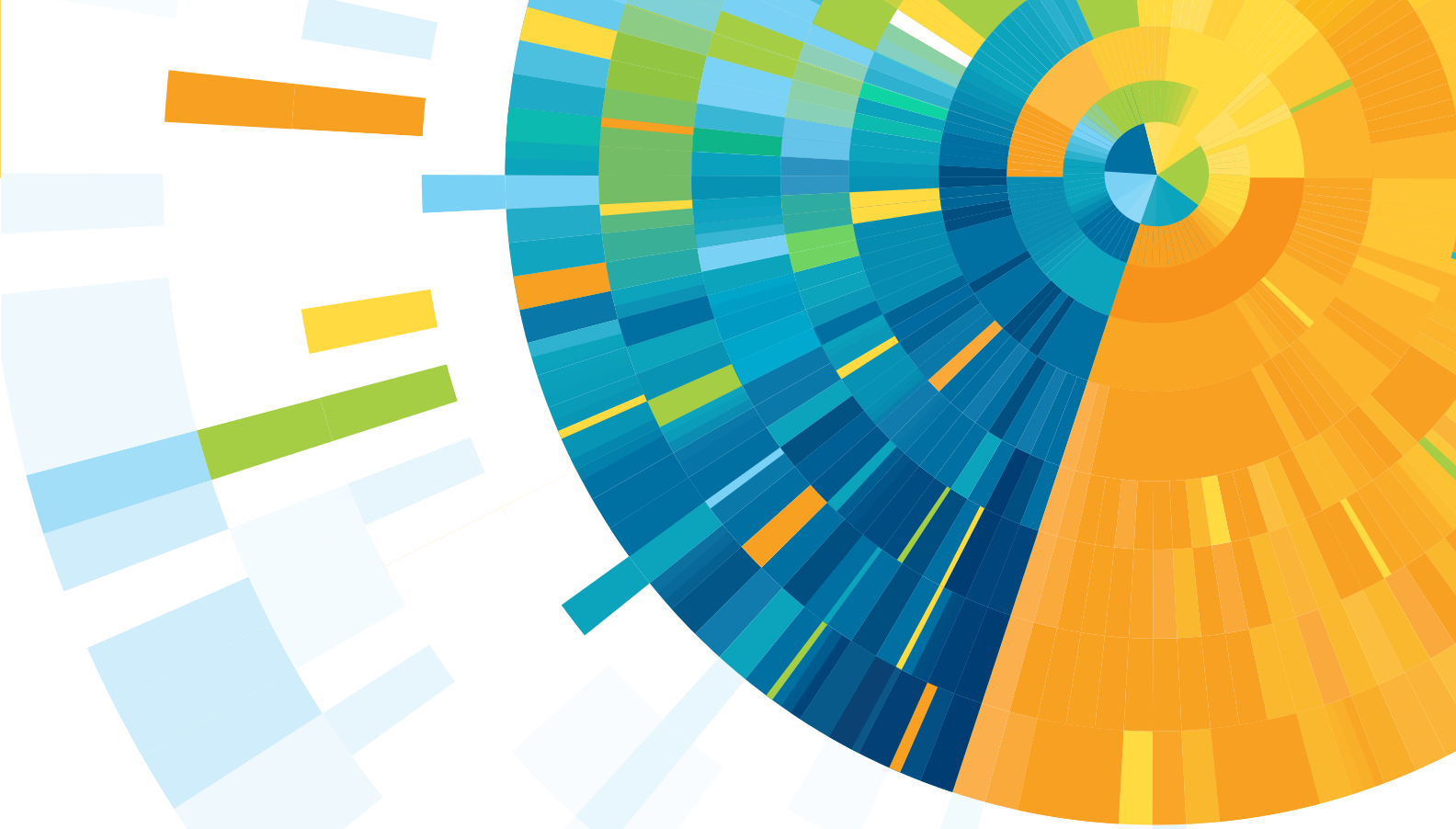
Understanding mechanisms of SARS-CoV-2 cellular entry is vital, as antiviral strategies targeting early stages of COVID-19 infection can be highly effective. Researchers know that the virus first uses its spike protein to interact with the cell's surface by binding to the ACE2 receptor on the plasma membrane. Next, SARS-CoV-2 likely is brought into the cell, but it's unclear how.

In a study in the Journal of Biological Chemistry, researchers at McGill University found that SARS-CoV-2 enters the cell via clathrin-mediated endocytosis, where the scaffold protein clathrin aids in packaging material into vesicles. In this study, purified spike protein and altered lentivirus bearing spike protein were used. The internalization of the spike protein into cells was examined and quantified.

Studies with purified spike showed that spike protein rapidly entered cells expressing ACE2 via endocytosis. When drugs known to block clathrin-mediated endocytosis were introduced, or when the expression of clathrin heavy chain was reduced, the cellular uptake of spike decreased dramatically.

Bayati devised the assay for spike protein uptake, which the team initially had trouble getting to work. Ideally, a fluorescently labeled spike protein would be used, but due to COVID-19 closures and a scarcity of available spike proteins, this wasn't possible. Bayati thought of using spike protein with a His6 epitope tag on it instead. With this, they were able to follow protein uptake using antibodies.

Jessica Desamero (jdesamero@gradcenter.cuny.edu) is a graduate student in the City University of New York's biochemistry Ph.D. program and volunteers with two science outreach organizations, BioBus and World Science Festival. Follow her on Twitter: @JessicaDesamero.



2022 ASBMB Annual Meeting

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ASBMB

EB Experimental Biology

The ASBMB annual meeting is held in conjunction with Experimental Biology.

MEETING CONNECTIONS

Have you made a friendship or connection, forged a collaboration, gleaned insight or had another meaningful experience at a scientific meeting?

To celebrate the return of the American Society of Biochemistry and Molecular Biology's annual meeting as an in-person event, ASBMB Today held an essay contest based on this question. Here are the winning entries.

FIRST PLACE

Science is all about connections, conferences and collaborations

By Desirazu N. Rao

My first 10 years of research as an independent investigator (1989–1999) largely were focused on restriction-modification enzymes as model systems to understand DNA–protein interactions. Just at the turn of the century (1999), I decided that I would study DNA repair proteins to understand how some proteins recognize damaged DNA.

As luck would have it, I secured a Union for International Cancer Control Yamagiwa–Yoshida cancer fellowship to spend three months in Paul Modrich's laboratory at Duke University to learn to make DNA mismatch substrates and DNA mismatch repair assays. Incidentally, the preparation of DNA mismatch repair substrates takes about two to three weeks.

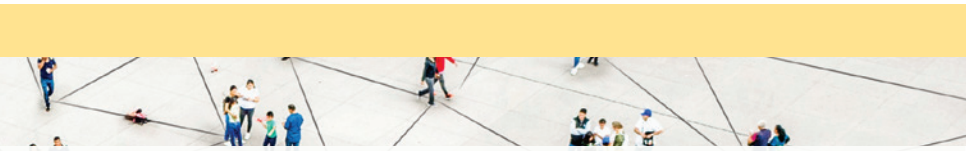
I brought back some of these substrates to my laboratory in Bangalore, and we set out to identify and characterize the mismatch repair proteins in the bacterium Haemophilus influenzae. Nimesh Joseph, a graduate student who had just joined my lab, cloned, overexpressed and purified MutS, MutL and MutH proteins and did some biochemical characterization.

Around this time, a number of research groups in the U.S. and Europe had done some wonderful work with the E.coli mismatch repair pathway and its proteins. Our work with H. influenzae proteins showed marginal differences but nothing spectacular. I decided to present some of our results at a Keystone Symposia on Molecular and Cellular Biology meeting on bacterial chromosomes.

I flew from Bangalore via Hong Kong and San Francisco to New Mexico — more than 20 hours of flying time. I landed at Albuquerque International Sunport on Feb. 7, 2004, to catch a limo that would take me to Santa Fe (via I-25 North) where the meeting was being held. There were five other scientists in the limo, and as we got to talking for the next 90 minutes or so, all signs of jet lag vanished. Sitting next to me was Wei Yang from the National Institutes of Health, Bethesda, whom I had never met. We talked briefly about our research interests.

Wei Yang was giving a keynote lecture the next day, and it was only then that I realized she was a crystallographer par excellence who had solved a number of structures of proteins involved in replication, transcription and repair. I remember asking her a question about strand discrimination signal in mammalian DNA mismatch repair.

That afternoon I presented our work on the H. influenzae DNA mismatch repair pathway. Several people were curious to find out



what was new about H. influenzae DNA mismatch repair as opposed to the wealth of information that already was known about mismatch repair proteins in the model organism E. coli. In fact, the 3D structures of some E. coli mismatch proteins already had been determined.

Toward the end of the session, Wei Yang stopped by and said she was curious to know if the H. influenzae mismatch repair proteins behaved differently from the E. coli ones. She added that scientists had problems crystallizing E. coli mismatch proteins when they were bound to DNA and asked me if she and her colleagues at the NIH could try cocrystallizing Mut H protein from H. influenzae and DNA containing a mismatch. I agreed, and I guess that was the starting point of our collaboration.

I came back to Bangalore after the Santa Fe meeting and sent the H. influenzae MutH overexpressing clone to Wei Yang. Her laboratory purified the protein, and in 20-odd days, they had set up crystallization trays and soon obtained beautiful crystals. Remember, these were DNA-bound MutH crystals — earlier attempts to obtain cocrystals with the E. coli protein had been largely unsuccessful. Even more thrilling was that these cocrystals were diffracting, and therefore acquisition of X-ray data was quick.

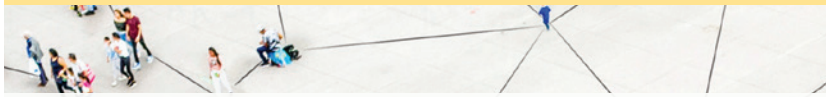
The structure of the MutH–DNA complex was solved less than four months after our clones reached the NIH laboratory. And with the 3D structure of the H. influenzae Mut H-DNA complex, we had a mechanism to explain how MutH distinguishes hemimethylated from fully or unmethylated DNA and by what mechanism MutH is activated by a mismatched base pair and the repair proteins MutS and MutL.

We wrote the manuscript up after doing more biochemical experiments, and it was published in the journal Molecular Cell, titled "MutH Complexed with Hemi- and Unmethylated DNAs: Coupling base recognition and DNA cleavage." This paper now has 90 citations (whatever that means). I am proud of it simply because I had not anticipated or planned for it when I landed in Albuquerque on that cold February morning — let alone meeting Wei Yang on that limo ride to Santa Fe. I've attended several conferences since then, but none of them has resulted in such a fruitful collaboration

I believe that going to conferences, meeting people whose work you are familiar with and making the necessary connections helps one not only to do good science but to enjoy doing science.

Desirazu N. Rao (dnrao@iisc.ac.in) is a biochemist at the Indian Institute of Science, Bangalore, where he studies DNA–protein interactions using restriction-modification enzymes and DNA repair proteins as model systems.

SECOND PLACE



An ion channel connection

By Sandra Rossie

Years ago as an assistant professor just starting my own lab, I was investigating Ser/Thr protein phosphatases that acted on sodium channels.

At a Society for Neuroscience meeting, a close colleague from my former postdoc lab suggested I view a poster by David Armstrong, a highly accomplished electrophysiologist. His work described regulation of a potassium channel by a phosphatase with similar properties to one that I was chasing. I got very excited and told David all the ideas his work suggested to me. He kindly suggested that I obtain his cell line from him and do the experiments I wished to do. I agreed and left.

Later, David dined with a friend of yet another old postdoc colleague of mine. That friend encouraged him to take me more seriously, and the next day he looked me up and offered to collaborate more closely, as he understood our skills were complementary.

David and I continued to collaborate until he recently retired from his position at the National Institute of Environmental Health Sciences. In addition to research, we co-edited a book on ion channels and initiated a Federation of American Societies for Experimental Biology conference devoted to ion channels.

David has been the most wonderful and generous collaborator and mentor over all these years. The thing I enjoyed most was that he would call out of the blue with outrageous ideas — he made me laugh like crazy and think hard outside the box. Some of those ideas turned out to be real. It was always fun and intellectually stimulating to do science with David.

Incidentally, as often occurs in science, the enzyme we both thought we were chasing was not correct — it turned out to be a new phosphatase family member, which made our journey that much more fun and exciting.

Like Experimental Biology meetings, Society for Neuroscience meetings are huge, and you never know what connections you can make. I have my good friends from my postdoc years to thank for this long-lived collaboration, and I try my best to pay it forward to young scientists in my own sphere of influence.

The lesson of this story is that science never happens in a vacuum — go out and tell your science story, make friends and have fun doing science together. It's vastly more enriching that way.

Sandra Rossie (rossie@purdue.edu) is a professor of biochemistry at Purdue University. She earned her Ph.D. at the University of Chicago, did postdoctoral work at the University of Washington and was an assistant professor at the University of Arizona before moving to Purdue.

THIRD PLACE

Finding connection in identity ambiguity

By Heather Dwyer & Martina Rosenberg

What does it mean to occupy an in-between space, both personally and professionally?

Our role in educational development often is described as a liminal position, somewhere between a traditional faculty appointment and a staff appointment. The two of us hold doctorates in the biological sciences, and we use our professional training to support instructors in their pedagogical efforts, from course design to classroom management to evaluating instructional effectiveness.

Referred to as "care work," this job requires emotional labor and is mostly completed by women — specifically, white women. Membership of the Professional and Organizational Development, or POD, Network, our national organization, largely identifies as white (85%) and female (75%). Given these statistics and a racialized society, it can be particularly difficult for educational developers with minoritized identities to navigate daily conversations around educational equity and act as a "key lever for ensuring institutional quality and supporting institutional change," as Mary Deane Sorcinelli and co-authors wrote in "Creating the Future of Faculty Development."

For us, in particular, our professional identity ambiguity intersects with our personal identity ambiguity. Both of us individually have struggled to come to terms with our racial identities. As half-Chinese, half-white women who were raised in Westernized communities (Germany, the United States), we never felt comfortable in the usual categories. Are we BIPOC? Asian? Are we allowed to join such affinity groups? Sometimes we pass as white — what are the implications of this? Are we imposters if our upbringings involved little Chinese cultural tradition and language? How do we relate to the lived experiences of other Asians and other people of color? And how does all of this impact our work, particularly in the realm of supporting diversity, equity, inclusion and justice in higher education?

We each had asked ourselves these questions alone. Then we found each other at a conference. The POD Network annual conference, held remotely in November 2021, for the first time incorporated affinity group meetings. We bumped into each other twice in spaces that were designated for Asian American and Pacific Islander folks and were pleasantly surprised at how natural it was to disclose our continued questioning and struggle with racial identity to a total stranger.

Our shared experience led us to establish a connection, thus beginning a mutual mentoring relationship. Though this relationship is nascent, we have discussed everything from our experiences as young children to the ways in which we navigate and even leverage our racial identities when working with faculty. Our miniature affinity group has felt affirming, both personally and professionally. Now we can ask, and begin to answer, some of these questions together.

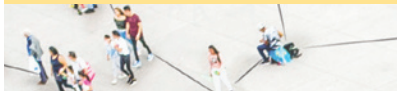
This connection would not have been forged had there not been affinity groups interwoven in the conference schedule. We appreciated the fluidity of self-selection — after all, Asians are not a monolithic group, and we are examples of that.

We encourage event organizers on national, local or even departmental levels to create space for affinity groups so members of underrepresented identities can seek one another for mutual support, understanding and inspiration.

Heather Dwyer (Heather.Dwyer@tufts.edu) is assistant director at Tufts University's Center for the Enhancement of Learning and Teaching. She earned her doctorate in ecology at the University of California, Davis, and has been supporting university instructors in their teaching since 2011.

Martina Rosenberg (martina.rosenberg@uconn.edu) is the director for teaching and learning assessment at the University of Connecticut. Her Ph.D. in biochemistry from Freie Universität Berlin, Germany, served her in neuroscience research, biochemistry education scholarship and now in academic development.

HONORABLE MENTION



Connecting with an inspiration

By Anju Duley

It was spring 2011. I was excited to attend the Indian Peptide Symposium organized by the Indian Peptide Society.

My supervisor informed me that Claudio Toniolo, a chemistry professor at the University of Padova in Italy, would be joining the meeting. I was very happy to hear that. I have been following his work from the day I started as a Ph.D. student. It was my wish to meet him one day and express how much his work has inspired me.

I prepared a poster on my recent publication to present at the conference. In the morning session, peptide researchers from all over the world presented their work. Finally, it was time to present posters in the afternoon. I was excited to see many scientists and students were visiting my poster.

Toniolo also came to see my work, and he was looking at my poster for a while. Then he looked at me and said, "It is a nice piece of work. You did a great job!"

It felt amazing to get this appreciation for my work from an accomplished researcher like him. During lunch, I was able to discuss my research work with him. We also had a nice conversation about foods in India and Italy, and he invited me to visit his laboratory in Italy.

On the last day of the meeting, the organizers announced the winners for best oral and poster presentations. I was surprised and overjoyed to hear my name as the best poster awardee. I felt great when Toniolo congratulated me.

COURTESY OF ANJU DULEY

Anju Duley met Claudio Toniolo at the 2011 Indian Peptide Symposium.

I never imagined these moments before I left to attend the conference. It was such a wonderful experience altogether. I feel inspired whenever I recall those memories.

Anju Duley (anjuduley@gmail.com) earned her Ph.D. in chemistry from the Indian Institute of Technology Kanpur. She is passionate about science communication.

HONORABLE MENTION

Evolving to connect

By Marilee Benore

Same time, next year?

That's how I feel at the end of every meeting, after a thoroughly enjoyable experience, immersed in stunning research, joyful camaraderie and good times.

And if you recognize that "Same time" phrase as the title of a 1978 movie, you're probably old enough to remember when American Society for Biochemistry and Molecular Biology annual meetings were centered more on research and less on making connections, and certainly, they were less diverse in attendees and events.

Back then, research reigned as the chief attraction, plenaries were stimulating, posters were insightful, and impromptu gatherings led to conversations and collaboration. The vendor booths were plentiful with cutting-edge instrumentation. Publishers' row burst with the latest in communication in the predigital days.

As an attendee, I was exhilarated by the research described by scholars whose work I admired and awed when I was able to meet and converse with esteemed big-name scientists. The biochemical insights I gained were critical to my work. Textbook authors and representatives were helpful and informative.

As a faculty member at a primarily undergraduate institution, however, I often struggled to feel fully a part of these research-oriented meetings. But all that changed in 1997, when the society hosted its first satellite education meeting where like-minded faculty got to meet, connect and form collaborations not just in teaching but in education research. The ASBMB had evolved to recognize not just research but also the importance of teaching diversity, ethics, inclusion and policy, noting that the future required a whole new approach in supporting BMB.

As one of my students joyfully exclaimed when he presented as an undergraduate, "I found my people!"

We began to gather annually, and colleagues initiated more education and inclusion events, student clubs and regional meetings; the ASBMB was supportive and inclusive. As faculty at smaller campuses, often

isolated from other biochemists and with a common mission to support, we hungered for connections, insights and collaboration.

Since then, and maybe it's a little embarrassing to admit it, attending the annual meeting and getting to see my friends and hang out and drink and share stories is a highlight of my year.

This group calms me down when I am frustrated by teaching; we joke and support each other, and they're there when I need an ear or a helping hand. We zoom, text and host occasional Friday night virtual wine gatherings to share good and bad news.

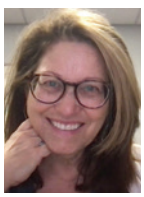
This group has sustained me.

At a time in my life when I felt that my work in education was not as valuable as being a hardcore researcher at a big university, this group helped me understand that we're not going to have a next generation of well-trained biochemists without our good work. And the ASBMB has supported this at our annual and specialty discipline-based education research meetings.

So this is really my heartfelt note to these amazing friends and colleagues — you know who you are, and you know that you have been an intimate part of my career and personal life. Thank you. Without you, I might have lost heart a long time ago. I certainly would have been more lost, more alone and more isolated. I would not be here without you. I really look forward to seeing you.

So — same time next year?

Marilee Benore (marilee@umich.edu) is a professor of biochemistry and biology and an affiliate professor of women and gender studies at the University of Michigan–Dearborn. Follow her on Twitter: @flavinchick.



HONORABLE MENTION

May I introduce you to a community of engagement?

By Audrey C. Shor

I was a bright-eyed, bushy-tailed assistant professor attending my first scientific conference since transitioning to academia at a primarily undergraduate institution from clinical research. To say the transition was a challenge is an understatement.

While I had heard of the American Society for Biochemistry and Molecular Biology in grad school, my focus was on oncology societies at that time. I had no idea just how transformative this conference was going to be for me. Attending ASBMB in Washington, D.C. in the spring of 2011 was an amazing experience and the exact level of diverse inspiration I needed to embrace my transition. I felt welcomed and at home.

Between the hallway conversations, science talks and array of workshops that I had to choose from, I was almost overwhelmed by the myriad of ways I could elevate myself. Attending the education workshop was the springboard to crafting my identity as an educator who actively engages with my students both in and outside of the classroom. This workshop inspired who I am today and helped me forge relationships with mentors near and far.

The interactions with others at this session all helped in my transformation; some resulted in deeper subsequent collaborations, others merely inspired me to think creatively about my engagement with peers, students and the community. Everyone who shared their experiences at this session shaped a piece of who I am today: Tim Herman, Shannon Colton, Peter Kennelly and Ellis Bell ignited all that I have accomplished.

After a year of feeling isolated and lost, I had found my people and knew how to scaffold changes in my approach with teaching, I had a better idea of how to use my clinical experience to introduce research efforts that could be accomplished with little to no funding or equipment, and I had fantastic ideas for community engagement.

These seeds of thought led to my involvement with the National Science Foundation's Connecting Researchers Students and Teachers, or CREST, project to engage undergraduates in science and later with BioMolViz, a group that promotes biomolecular visual literacy. The experience transformed my approach in the classroom and laboratory. I began using hands-on, applied learning, with elements drawn from process-oriented guided inquiry learning, problem-based learning and course-based undergraduate research experience — known as POGIL, PBL and CURE. I was inspired to apply for seed funding via the ASBMB's Hands-on Opportunities to Promote Engagement in Science, or HOPES, program, to initiate amazing community engagement experiences for my students and community.

As a result of this meeting, not only did I have more fun in my new profession, but I also shaped better future scientists and clinicians. I only hope that I have since had a chance to inspire others as well.

Audrey Shor (Audrey.Shor@apothecom.com) is a senior medical writer at ApotheCom. She was previously an associate professor of biology at Saint Leo University.

‘If I don’t, who will?’

As institutions inch toward their diversity, equity and inclusion goals, it’s women and people from marginalized groups who are doing the lion’s share of labor — for free and at great cost.

By Lea Michel & Desirée Forsythe

NOTES FROM THE AUTHORS

A matter of consequence

To write or not to write. That was the question I asked myself a hundred times as I contemplated writing this essay.

If I were to write an essay about uncompensated labor, I knew I would have to discuss certain things. I knew what those things were, how to write about them and what I wanted to say. The problem was: What would be the ramifications of bringing those things up?

For example, as a person of many privileges, would I come across as a complainer, especially when my burdens are not nearly as heavy as those of my Black and brown colleagues?

If I brought up the mental and emotional burden of mentoring students — not just on the expected things like getting into grad school and finding a job but on the more personal challenges like dealing with anxiety, depression, loss and feelings of inadequacy and lack of belonging — would students stop asking me for help? Would they pause before coming to me with their problems and ask themselves, “Should I really burden Dr. Michel with this when she clearly has so much other stuff on her plate?”

I would hate for an essay that’s supposed to be helpful to end up being hurtful.

And then I realized that, although this is a personal essay, it’s not just about me. It’s about all of the faculty members, especially women and people of color, who take on uncompensated labor every single day and whose careers often are stymied and sometimes ended by these extra burdens.

So, here goes …

— Lea Michel

A house of cards

Every morning, as I get ready for the 30-minute drive to campus, I finish putting together my house-of-cards schedule.

I know better, yet I continue to plan out my day with no margin of error, scheduling meetings back to back, sometimes finding 15-minute holes and then immediately filling those holes with tasks that are due (or, let’s be honest, overdue).

This may sound familiar to all of us in academia. However, it is important to note that all of our overfilled schedules are not created equally.

How many search committees do we say yes to because we know we may be the only ones in the room to represent a perspective shaped by social constructs and systemic oppression? How many hours do we allocate to mentoring students who often seek us out because we represent identities that are scarce in academia? How many panels, talks and invited speaking events do we attend for free because we worry about the consequences of the audience not hearing what we have to say (or, even more troubling, because we believe we don’t deserve that compensation)?

How many times do our house-of-cards schedules get toppled because a student comes to our office in tears over something deeply personal and traumatic, and we know we have to stop everything to get them the help they need?

While the mere act of writing this essay could be counted as another act of uncompensated labor, I was excited to collaborate with a colleague who gets it and have room to discuss both our own experiences and what changes could be made in academia to address this burden.

Here are our thoughts …

— Desirée Forsythe

The problem as we see it — and a few solutions

For the past decade, we've been told that diverse teams are more productive, creative and higher achieving than homogenous teams.

On its face, this makes sense. Diverse teams bring in diverse experiences, creating a wider variety of ideas and solutions that will work for a larger number of people. Historically, we can point to many institutions (say, the United States government) wherein an overrepresentation of a few led to policies and practices that harmed many.

However, the problem with diverse teams comes when the pool you're working with isn't all that diverse in the first place, so the one person of color (feel free to insert any other marginalized identities here) is asked to serve on every committee. And while some committees are prestigious and may even get you face time with the VIPs, most committee work is arduous, time-consuming and — let's just say it — should have been an email.

But here is the hard part: What's the alternative? Having homogenous committees that lack the perspective of a more diverse faculty?

For certain committees — such as tenure committees, faculty search committees, faculty affairs groups and academic senates — that is unacceptable, and every attempt should be made to make those committees as diverse as possible.

But for many other committees, yes, that's a price we're going to have to pay until we have a larger, more diverse pool of faculty.

In other words, if you don't have a diverse faculty (and hopefully you're working on getting one!), you can't expect a small minority of people with marginalized identities to serve on all of the committees. It's unrealistic and often detrimental to their careers.

Instead, nominate them for committees that will help them with their careers and/or have the most impact on the university, such as committees that provide leadership opportunities, those in charge of selecting the future faculty, and those that write or vote on policies and procedures.

It is also important to note that the university itself has a responsibility to support its diverse faculty members who already are employed and to promote initiatives that will improve the culture of inclusion.

For example, faculty members should be compensated if they go above and beyond what is expected. If a faculty member who is already doing a ton of service is needed to serve on a time-consuming committee (a search committee, for example), then see how you can lighten their load in other areas (for example, by hiring a grad student to help them with grading or giving them the class section with fewer students or with the more accommodating schedule).

Additionally, in spaces that are not diverse, the university should hire outside consultants both to help address the lack of diversity within the institution and to design and implement practices to address places of systemic oppression on campus.

Of course, while service and committee work is incredibly important, students are really the bread and butter of our universities and often the focus of much of our

attention. And while the student population is changing (more than 44% of the college population is nonwhite, and women earn 57% of bachelor's degrees), the makeup of the faculty hasn't caught up. Women and people of color are still underrepresented in the academy, especially in STEM fields.

So what does this mean? Taking this back to uncompensated labor, it means there's a mismatch of students and faculty members.

There are fewer role models that students of color can see themselves in. There are fewer mentors that students with minoritized identities of sexuality and gender can feel safe working with. And there are fewer faculty who know the resources and ways to help students with disabilities. This mismatch places a larger burden of student mentoring on those faculty with whom the students can relate.

Do white men make excellent role models and fantastic mentors? Yes, of course. But when a student is looking for a faculty member to confide in, to share their emotional burdens with, and to ask for personal advice and guidance, they often find faculty members with whom they can identify or who can (at least from their perspective) understand where they're coming from.

That's why women, faculty of color and those with other marginalized identities tend to spend more time mentoring and meeting with students than their colleagues.

It is important to note not only the amount of time that goes into this type of mentoring but also the emotional toll that it takes.

Many of us are wading through our own daily identity-related aggressions, processing our own trauma and attempting to survive in a world that was not constructed with us in mind.

While many of us always felt that this was a heavy load to carry, the amount of psychological and physical distress that we see in our students recently has been amplified, given the COVID-19 pandemic and society's overdue awakening to systemic racism.

The students we support are immensely important to us, and we ask ourselves: "If I don't, who will?"

Not only is this uncompensated labor unequally relegated to women and people of color, but the long-term effects on these faculty members can be quite serious.

These faculty members spend extra time on mentoring students and serving on panels (women and faculty of color often are asked to be on panels in order to round out the otherwise white, male group) and committees (especially those related to diversity, equity and inclusion efforts at universities). Meanwhile, their colleagues spend that time on research efforts that more directly lead to increased productivity and other promotable endeavors.

Overcoming these challenges won't be easy, and there are many systemic barriers that must be toppled before real change can be made.

But first and foremost, it is important to become aware of the unfair burden that women, people of color and others with marginalized identities share when it comes to uncompensated labor.

While recognition by those who hold positions of power within the academy is a first step in a much-needed journey toward equity, additional steps must be taken to ensure the health and success of diverse peoples within academia.

Lea Michel (lvmsch@rit.edu) is an associate professor at the Rochester Institute of Technology and a member of the ASBMB Minority Affairs Committee.

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Lonely science

Impacts of the pandemic on women in academia

By Swati Agrawal, Marilee Benore & Pamela Mertz

During the COVID-19 pandemic, **Pascale Guiton** lost some of her valuable parasite strains because she was unable to get into her lab to replenish the liquid nitrogen.

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Instead of submitting publications before her fourth-year review, a month and a half into her pretenure sabbatical, **Krystle McLaughlin** was at home taking care of her two small children.

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After being told she had been denied a promotion because of low research productivity, **Nazzy Pakpour** chose to leave her faculty position and seek employment in the private sector.

.....

In August 2019, **Megan Filbin** won a grant to take her undergraduates to a large medical school to use research instruments not available at her institution. But all the labs were closed to visitors in summer 2020, and complications with limited lab capacity and vaccination requirements stymied the plan in 2021.

.....

As a department chair, **Karen Allen** had to ramp down the labs of 26 faculty members and then, after reviewing safety evaluations and plans for each one, ramp them all back up.

.....

Sonia Flores and colleagues in her department and division provided meals and vouchers to help pay for dependent care to faculty who were on the front lines fighting COVID-19.

.....

Marlene Belfort said about 2020, "Science became a lonely activity."

While the COVID-19 pandemic disrupted the professional and personal lives of scientists, some groups were affected more than others. Most were unable to conduct research. Science education, especially skills training, was disrupted. Those who took on childcare, homeschooling or elder care found their lives and work completely upended.

As women in biochemistry, we read reports, such as one by the National Academies of Sciences, Engineering and Medicine, that women and early-career scientists were among the hardest hit. We were worried that efforts to diversify the science, technology, engineering and mathematics workforce might be lost, as women, historically marginalized groups and early-career scientists struggled to meet the double demand of work and new family obligations.

Preliminary data from a study done by University of Michigan–Dearborn faculty showed disheartening statistics and comments from women in STEM about the impact of COVID-19 on their careers and work–life balance, exacerbating existing imbalances. Even more disturbing are changes in student enrollment tallied by the National Student Clearinghouse Research Center; while graduate student enrollment increased significantly, especially in biology and biomedical areas, undergraduate enrollment in those areas plummeted. At undergraduate and two-year institutions, enrollment of undergraduate students declined 8% to 15%, with more precipitous drops in students of color.

Using our personal networks and suggestions from the ASBMB Women in Biochemistry and Molecular Biology Committee, we reached out to women at various career stages and institutions, asking if they'd be willing to be interviewed by one of us for this article. We hoped to learn how they fared, what support was available to them and what worried them but also what they have gained from the experience. We asked how their institutions handled the impacts of the pandemic.

We heard from early- and late-career scientists, department chairs, and those involved in STEM inclusion research. They told us about the direct impact of lost

Women researchers faced far more work difficulties during the pandemic than men

Percentage of respondents of each gender who reported experiencing the following situations in a survey taken in May 2021.

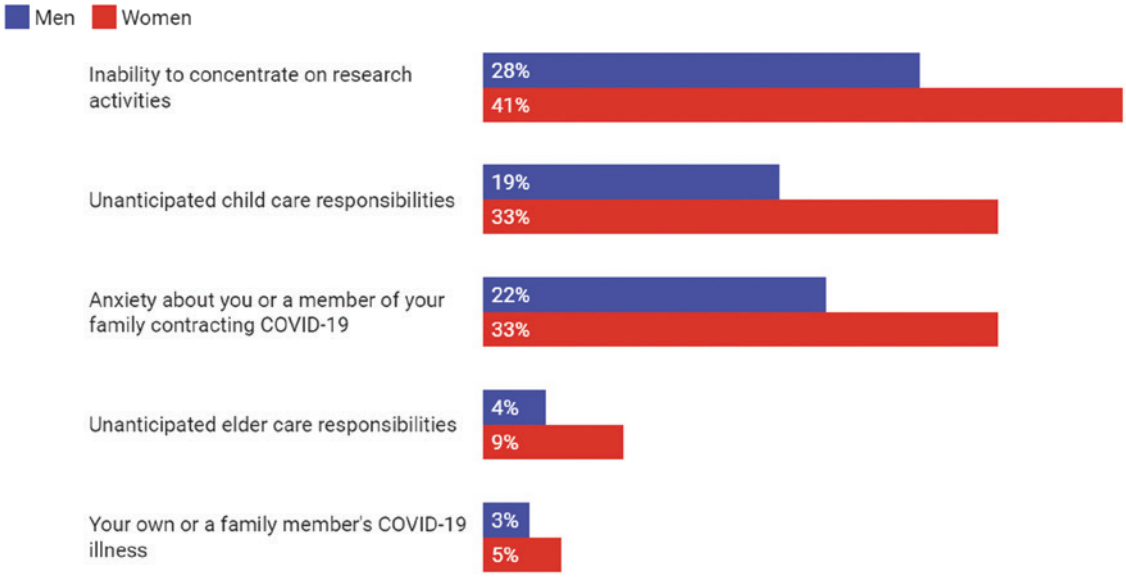


CHART COURTESY OF THE CONVERSATION AND BASED UPON DATA FROM THE SCIENTIST OPINION PANEL SURVEY

time and research as well as coping with stress, isolation and the erosion of community.

Women told us that the COVID-19 pandemic exacerbated prior inequities in the time required for their family and home care responsibilities.

Educators who suddenly were unable to be in a lab or a classroom with students had to develop kits or online substitutes, creating asynchronous online lectures and virtual assessment tools. The time required for this meant research took a back seat. Many faculty noted that students quickly adapted to the technology but suffered from the lack of socialization, structure and teamwork.

For early-career faculty, the loss of interaction, mentorship and guidance was difficult to overcome. Without direct intervention and support, some lost faith in the academic system and their own career choices.

University administrators, already overburdened by stress, student mental health problems and the challenge of completely revamping the way we teach science, attempted to compensate by offering to extend the tenure clock, burdening untenured faculty with a choice that weakened their financial and career positions while saving the university money. Few campuses reduced teaching loads so early-career faculty could catch up on lost research time.

Here are some individual stories.

Lost boundaries

Pascale Guiton, an assistant professor in the biological sciences department at California State University, East Bay, said a group of students she had trained graduated without ever being able to work in the lab. Zoom training sessions were an ineffective substitute, and all the animal work she had just started before the pandemic came to a halt.

PASCALE GUITON

In summer 2020, Guiton started BIPOC in STEM at CSUEB to give students of color a space to speak and express their fears about police violence and the racial reckoning that was happening around the country, as well as what it means to be a person of color in STEM and higher education. To rally all faculty members to support Black students, faculty and staff, she founded the Alliance for the Black Community that same summer. This all required extra work and was emotionally taxing. Because it was not typical university service, she doesn't know how much

weight this effort will carry in her tenure assessment.

Guiton lost all her parasite strains due to a preventable power outage, she said. Her petition for compensation and a course release was granted, although she was unable to replace all she lost, and her research was seriously delayed.

Guiton said she lost boundaries between work and the other parts of her life: responding to student emails in the middle of night, granting extensions on assignments and spending more hours talking to her students after classes. She had difficulty finding time for simple things like making a meal or walking her dog.

Guiton was concerned about tenure and promotion based on loss of productivity and all the changes in teaching. She has some publications but was hoping to tell a more complete story with additional research publications. She accepted Cal State's offer to extend her tenure clock and was given the course release in Fall 2021 to work on getting her lab back up and running. However, this extension should not be the default option, as it means a delay in getting the raise in salary that comes with promotion.

"The impact of the pandemic on faculty workload, especially faculty with children, was not explicitly addressed by Cal State, and the amount of extra work faculty did was not fully appreciated," Guiton said.

The pandemic revealed that faculty in higher education are not as valued as one would expect, she said. "What they demonstrated to us is that they will continue to operate, whether individual faculty are there or not. It's up to faculty to stand up and say, 'There is no university without the faculty.'"

The world we live in now

Krystle McLaughlin, an assistant professor in the chemistry department at Vassar College, is completing her dossier for her fourth-year review. Her work was impacted hugely by the pandemic, she said.

She was set to teach a new biophysical chemistry class in fall 2020, but because she was stuck at home with her children, one of them an infant, without available family or paid help, she wasn't ready until right before the semester started and was just a little ahead of the students throughout the course.

McLaughlin is a crystallographer but ran into problems similar to those faced by her colleagues doing animal research. "I had started growing some crystals in January 2020 at the start of my sabbatical and they looked really good," she said, "but then we had to leave and I didn't even really get a chance to do anything with them. By the time I came back to the lab … everything had dried out."

McLaughlin faced challenges training her team in fall 2020 when the lab reopened. "It was really hard to build lab camaraderie," she said. "We couldn't go out like normally for lunches, do things with them. So I feel like that was really hard for the students in the lab as well as me … it was hard to train them and get connected to them and really mentor them and figure out what they needed."

KRYSTLE MCLAUGHLIN

Adapting her courses to online or hybrid modes and developing flexibility for students required a lot of extra work. "Very stressed-out students come talk to you," she said, "and you know their family is sick, and you know there's all kinds of things happening. A lot more students are coming with those issues because that's the world we live in now."

On a positive note, as a result of hybrid teaching, McLaughlin said she now annotates her PowerPoints; she projects them as she walks around the classroom writing notes on her iPad. It looks like writing on the chalkboard, but it's notes. Students get a copy later, and she said they have really appreciated this resource.

As McLaughlin prepares for her fourth-year review, she said she is grateful to have taken advantage of the one-year COVID-19 tenure clock extension the college offered; however, she's not sure if it was enough, as many pandemic challenges are ongoing. "I don't know how they are really going to measure me. … This is going to be the first year where people who are in the pandemic are going up for review."

She felt supported in the department and said her colleagues have offered help. Her chair helped her negotiate an additional course release because she didn't get to do research in spring 2020. But it's still a challenge; she and many of her peers at the same stage haven't really moved forward since last year, she said.

"I'm not exactly in the same place, but I have moved sort of incrementally — not what I might expect prior to the pandemic frame."

Promotions denied

Nazzy Pakpour was an assistant professor who recently came up for promotion and tenure after six years at her university — the last two during the pandemic. She was granted tenure, but the tenure committee denied her a promotion. She decided to resign and take an opportunity in industry.


NAZZY PAKPOUR

The tenure and promotion committee told Pakpour she could have been more productive during the pandemic in terms of applying for grants, attending virtual conferences and doing more in the lab. She disagreed, saying she went well beyond reasonable expectations: shifting her classes online, creating take-home lab kits for students, holding extended office hours, restarting her lab and mentoring her graduate students through a pandemic and publishing two papers based on her educational research.

Pakpour's primary research was on malaria transmission and Type 2 diabetes, but for her first two-and-a-half years, her animal research facilities were under construction. She started her research program about a year before the pandemic hit and then had to shut it down and later restart it. She lost all her parasite stocks in a power outage during the pandemic and had to remake all the strains from scratch with limited lab access and social distancing constraints in effect. The school's veterinarian quit, and she had to wait for a new one to be hired.

"I actually made a timeline in my tenure file where I showed how much time I had access to research space versus how much time I was waiting for things," Pakpour said. "In the six years leading up to tenure, I have probably had only half the time to do bench work."

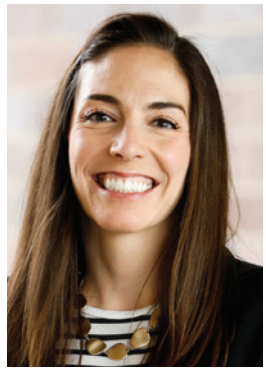
In October 2021, Pakpour was told for the first time in six years that her research did not meet expectations, she said. "I didn't have clear communication about expectations in terms of tenure and promotion. Indeed, the standards applied to me have changed from year to year because my department has no specific written guidelines."

Pakpour published four articles about education research, but the committee discounted these because education was not the area for which she was hired. She previously had published two malaria papers, but these were excluded because the data was not generated on the campus. She applied unsuccessfully for an R15 National Institutes of Health grant; slow progress in the lab and lack of preliminary data meant she couldn't apply for the large institutional grants the committee wanted to see.

Pakpour submitted a rebuttal for her tenure review at the department level, but the committee stuck to their findings. She chose to leave the university rather than go through the process of fighting for a promotion she felt she deserved.

Revival and quick decisions

Megan Filbin, an associate professor of chemistry and biochemistry at Metropolitan State University of Denver, had difficulty recruiting students to do research when her campus was fully virtual. She had limited access to equipment, and limited numbers of students were allowed in labs. She had one research student during the lockdown period and now has six, with more wanting to join her lab. The grant that would have allowed her students to train on equipment at the University of Colorado School of Medicine is now in its final year, and she plans to apply for an extension.


MEGAN FILBIN

Filbin applied for promotion to professor this academic year and said her university has a policy that "reviewers, through every level of review, need to be mindful of perhaps less service and less research due to the pandemic." In addition, student teaching evaluations optionally were waived in spring 2020. Her university also made decisions quickly throughout the pandemic, which she really appreciated.

A house of cards

Karen Allen, a professor and chair in the chemistry department at Boston University, said that two of the three tenure-track professors in her department took the offer to extend their tenure clock. Not all were women, but all three had children. Keeping up with schedules

and tutoring for children doing online education took a lot of parents' time and affected professional productivity and focus, she said.

A collaborator made the analogy that "Writing a paper is like building a house of cards, you can't start to make a house of cards and then walk away from it and come back an hour later and expect to find what you've done still there," Allen said.

KAREN ALLEN

The ability to focus on complex problems has been shattered for some during the pandemic, she said, "so having that extra year is absolutely essential."

BU granted an additional semester of teaching release for junior professors, or they could opt to have one month of summer salary to help allay the financial loss of delaying promotion, Allen said, adding that it's hard to quantify all the extra efforts and time spent shifting courses online during spring break in 2020 and then switching to hybrid teaching in fall 2020.

For women, Allen said, the pandemic blurred personal–professional boundaries. They were more likely to experience disruptions in teaching due to interruptions at home and longer days as many started work very early and/or worked very late to accommodate family commitments. As the cook in her family, Allen said she had to make all the meals three times a day; before the pandemic, she only made one or two meals a day.

Clear differences

Sonia Flores, professor of medicine and chair for diversity and justice at the University of Colorado School of Medicine, cited a survey (a work in progress) showing clear gender differences in how the pandemic affected men and women in academia. Women often had a harder time disconnecting from the emotional responsibilities of childcare when they were working at home, she said.

SONIA FLORES

In a focus group to support research and clinical faculty at her institution, she said, a theme that kept bubbling up among women was "the feeling of separation, abandonment, I don't belong."

In a male-dominated field, even before the pandemic, women understood they had to work three times harder than male colleagues to get the same amount of recognition, she said. "They relied on the connections they had with the people in their lab, in their offices, and in their units, and in many cases, communications with their bosses. All of a sudden, all of that stopped and they felt even more marginalized and more excluded. The silos that naturally exist became worse during the pandemic."

Based on a survey of the department of medicine faculty, younger women were affected most adversely by the pandemic because they had to care for children. Even when male spouses were at home, most childcare responsibilities fell on women. Monitoring children and helping them with schoolwork took time away from grant writing. Lack of access to labs and animals delayed research for six to eight months.

Flores' department asked leaders like her to donate a percentage of their salaries for three months to keep the department operating without resorting to furloughs or cutting salaries of people other than senior administrators. The university later used CARES Act funding to give money to all faculty and staff, irrespective of position, and pay back anyone who took a pay cut.

Lost connections

Marlene Belfort, a distinguished professor in the biological sciences at the University of Albany and senior adviser of the RNA Institute, agreed that the pandemic took the greatest toll on junior faculty. The loss of time to do research, write papers and prepare grants was a more serious disruption to their careers than to those of their more senior colleagues, she said.

A group Belfort co-founded, Women in Science and Health, promotes networking, mentoring and skill building for faculty, postdocs and staff. Regular events are scheduled, including seminars on inclusion, how to seek mentoring and resources, and how to be that "hand up" for someone else, she said. This type of networking can make a critical difference in times such as pandemic shutdowns, providing the connections that are necessary for both mental health and training.

Women faculty have felt the loss of camaraderie and mentoring keenly, Belfort said. Graduate students lost connections and networking and didn't even get to meet face-to-face during the first year. Support was only possible via virtual communication, but a resilience training

program sponsored by the NIH allowed Belfort to reach out and help graduate students during this difficult period.


MARLENE BELFORT

To recover from the pandemic, Flores said, words of encouragement are essential. It's important, she said, to have "someone in a leadership position who's telling them it is OK — it is OK to take time off to be with your family, it is OK to take time off to grieve."

Like Belfort, Allen said she has seen more isolation and depression among graduate students. "For all the scientists, but especially the young assistant professors coming up, and the women who are still making their way through STEM, it is so important to support them emotionally to recover from this."

Allen suggested working one-on-one or forming groups that can talk, network, and share ideas and ways to be resilient. And the best way to get through this isolation for students and faculty? "Be compassionate to one another," she said. "Find one another, and share solutions and ways to be resilient and overcome."

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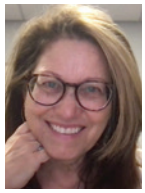

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Scientific sisterhood knows no bound(arie)s

By Megan Filbin, Marisa Ruehle & Yumeng Hao

Even before the pandemic rolled around, each of us felt isolated at work.

Megan: I was in my sixth year as a faculty member at a primarily undergraduate institution, which can be isolating scientifically when the researchers are all undergraduates and the department is small enough that colleagues work in vastly different biochemical fields. I missed having a community of experts, particularly within my field of research, where I could discuss and develop ideas.

Yumeng: I was an international postdoctoral fellow at an R1 institute when the pandemic hit. I'd worked on a project that was close to publishing and designed and taught multiple courses at my university. The pressure to advance my career boiled down to tough career and life questions: Should I stay in academia or go to biotech? Should I find a job in the U.S. or back home?

Marisa: I was in the fourth year of a postdoc in a lab that was still a bit of a culture shock, despite being in the same institution where I did my Ph.D. I'd been warned not to stay for a postdoc, and then I was overwhelmingly advised to "diversify your training" (translation: change fields, departments, colleagues as drastically as possible). So I changed fields substantially. While many skills transferred, I couldn't help but feel like a round peg trying every day to cram myself into a square hole. The intellectual fit was off, and the feeling of unbelonging was pervasive.

Were our feelings of isolation and not belonging the result of our career choices, or were they a byproduct of the physical/social isolation of the pandemic? More importantly, were they inevitable, or was there something we could do about them?

The need for community

The communities we exist in as we navigate an academic science career path uniquely shape the way we think: our connections and collaborations we make, our blind spots and even our passion for our work. This is part of why we are told that it is so important that we diversify our training at each career step — from undergrad to grad school to postdoc — because new communities allow us the opportunity to broaden our view of science and expand our expertise.

Historically, this diversification has been synonymous with moving around the country or the world to pursue training opportunities. While this can be wonderful, it becomes a problem when — for whatever reason — we are restricted to working in locations or communities that are not supportive.

The issue of geography disproportionately impacts women's careers. Women who choose to move from place to place in pursuit of their career ambitions often uproot themselves from family and other support systems that are so important for women generally and for mothers especially. On the other hand, a woman who restricts herself geographically for a spouse's career or to remain close to family also restricts her opportunities — and elicits the side-eye of grant reviewers and colleagues who see her as not taking her career seriously.

Whatever side of this Catch-22 a woman ends up on, she needs to be engaged in a supportive community. Multiple studies show that work climate has a huge impact on women's career advancement — and even more so for women in STEM disciplines. In addition to inequitable hiring, funding, salary, teaching expectations and resource allocation, women in STEM lack support networks and mentorship. This can lead to feelings of isolation, self-doubt, imposter syndrome and incompetence that all manifest in a lack of female STEM leaders (according to AAUW, women only make up 28% of the

COURTESY OF YUMENG HAO

Yumeng Hao, Megan Filbin and Marisa Ruehle share a moment of celebration during Filbin's 2012 graduation at the University of Colorado Anschutz Medical Campus.

STEM workforce). Additionally, it's no secret that mental health in science is a big problem without clear solutions, and our workplace cultures absolutely play a role in this.

In discussions about how to improve academic science both as a career path and as a way of life (let's be honest — that's really what it is), we must recognize the importance of the communities and environments we work in. We must understand the attributes that make a culture productive, ethical and nurturing and the attributes that don't. Moreover, we need a toolkit to deal with the inevitable times when our environments just aren't checking our intellectual or emotional boxes.

So we asked ourselves whether we could create our own environment to fill the gaps in our intellectual and professional lives.

The RPL3 sisterhood

The three of us grew up together in science. Between 2009 and 2012, we worked side by side in a graduate research lab at the University of Colorado School of Medicine, and despite joining the lab in different years, we developed a deep bond as scientific peers and more specifically as what we call "scientific sisters." As graduate students, we taught each other experiments we had mastered individually, ran ideas by one another, and looked at one another's data to see if we had come to the same conclusions. We created an environment of mutual respect, encouragement and empowerment as we became independent scientists.

Could we recreate that environment now that we were spread out across the country, working on different scientific questions and in different stages of our careers? After a few months of social and physical isolation as we all shifted to working from home in early 2020, we decided to give it a try.

In June 2020, we crafted a plan: We would rotate presenters on Zoom for an informal weekly group meeting. Each of us would present data or an idea, and we would simply discuss. Probably because we so craved this kind of interactive and lively discussion, buy-in was immediate from all three of us, and our group was born. We jokingly called our group RPL3 — initially short for "RNA Power Ladies x 3" until we realized it could also be a very nerdy nod to our common love for ribosomes (ribosomal protein L3 is abbreviated "rpL3").

After a few months, our meetings evolved and became a flexible space where, in addition to data, we could present practice talks for upcoming poster or seminar presentations. We also had some stress-relieving sessions

when we just needed to vent and have someone supportive to listen. More than a year and a half later, we are still meeting — now twice a month — and we have helped each other problem-solve difficult experiments in the lab and overcome career obstacles and career moves. While we still face some isolation at work, the three of us agree that this group has been a game changer in terms of intellectual and emotional support.

Build your own

Are you seeking mentorship, connection and support? Take a moment to consider the people in — or out of — your environment whom you respect, admire and feel comfortable seeking guidance from. This could include a colleague a few doors down or someone in a different time zone. Reach out to them and ask if they'd be willing to participate in a small, structured group with a focus on learning from one another, thinking about big-picture ideas and participating in informal peer reviews. It may take a few group iterations for you to find the right fit — individuals who are dedicated to the group's mission, protect the time your group meets and participate wholeheartedly.

Even in the midst of a pandemic when you're feeling very isolated, we hope you'll find that the supportive community you create — your own scientific sisterhood — helps you persist and succeed long into the future.

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Scientist – Proteomics/Glycoproteomics
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https://careers.asbmb.org/job/scientist-proteomicsglycoproteomics/61082730/

Lecturer
University of Wisconsin

The Department of Chemistry and Biochemistry at the University of Wisconsin-La Crosse (UWL), invites applications for one-year term Lecturer position(s) to begin August 2022. The department strives to maintain an inclusive and collegial working and learning environment for our faculty, staff, and students, and we welcome applicants who share our commitment to these values. The department is seeking applicants with interests in teaching undergraduate biochemistry and/or general chemistry courses.

https://careers.asbmb.org/job/lecturer/61209855/

Research Specialist III
Howard Hughes Medical Institute (HHMI)

We are currently looking to add an accomplished and passionate Research Specialist III in the lab of Dr. Danesh Moazed at Harvard Medical School. The Moazed Lab is investigating the mechanisms that govern the assembly and epigenetic inheritance of silent chromatin domains. The laboratory uses biochemical, structural, genetic, computational, and high throughput approaches to study epigenetic inheritance in yeast and mammalian model organisms.

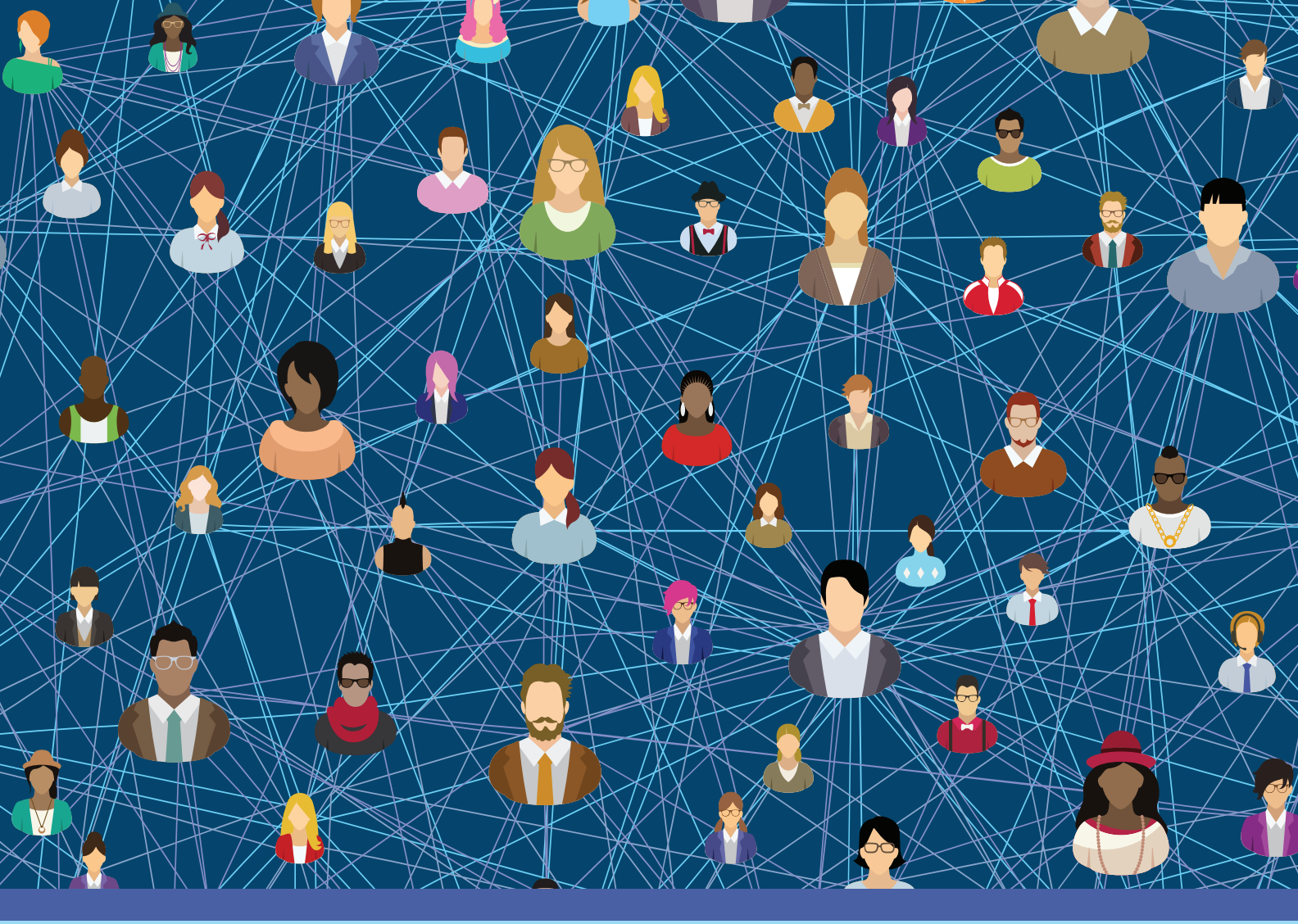
https://careers.asbmb.org/job/research-specialist-iii/61147511/

Post-doctoral associate
Albert Einstein College of Medicine

A position for a postdoc is available immediately in the Cowburn lab at Albert Einstein College of Medicine, focused on NMR based structural biology. Areas of focus are characterization of interactions of intrinsically disordered systems in selective transport in the nuclear pore and protein engineering applications and basic mechanisms of inteins.

https://careers.asbmb.org/job/post-doctoral-associate/60205392/

To see a full list of jobs, please visit careers.asbmb.org



Connect with colleagues at an ASBMB meeting

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

Upcoming ASBMB events and conferences

2022 ASBMB Annual Meeting
April 2–5, 2022 | Philadelphia

ESCRT biology
May 17–20, 2022 | Madison, Wis.

O-GlcNAc regulation of cellular physiology and pathophysiology
July 7–10, 2022 | Athens, Ga.

Evolution and core processes in gene expression
July 21–24, 2022 | Kansas City, Mo.

Mass spectrometry in the health and life sciences
Aug. 14–18, 2022 | Cambridge, Mass.

The interplay between epigenetic regulation and genome stability
Sept. 28–Oct. 2, 2022 | Seattle

Transcriptional regulation: Chromatin and RNA polymerase II
Sept. 29–Oct. 2, 2022 | Snowbird, Utah

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

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