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ASBMB TODAY

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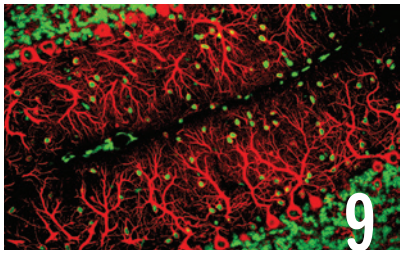

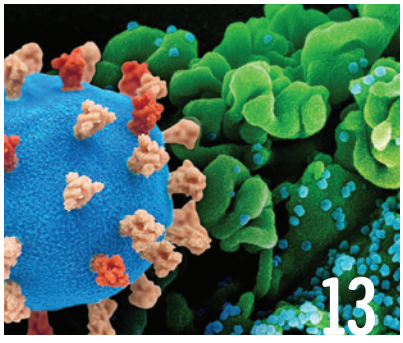

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ASBMBTODAY
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Talking about maximizing access

By Ann Stock

To increase awareness of American Society for Biochemistry and Molecular Biology activities, during my term I'm talking to chairs of the committees that steer the society's initiatives.

I recently spoke with Sonia Flores of the Maximizing Access Committee, or MAC. Sonia is a professor of pulmonary sciences and critical care at the University of Colorado School of Medicine. She has chaired the committee since 2020.

Our conversation has been edited.

Sonia Flores

AS What led you to join the MAC?

SF About 10 years ago, Craig Cameron invited me to give a talk about my HIV work in a session he organized at an ASBMB annual meeting. After that, he asked me to join what was then called the ASBMB Minority Affairs Committee, which he was chairing at the time.

AS What personal experience do you bring to the MAC?

SF I am originally from Puerto Rico. When I moved to the continental U.S. to do my Ph.D., for the first time in my life I was exposed to a lot of microaggressions, a lot of biases, people assuming that I was there as part of a quota. As a Ph.D. student in basic medical sciences, I took classes with medical students who assumed I was inferior.

I realized that there are a lot of students who have no role models, and they have never seen anybody like me getting a Ph.D. I decided that, in addition to my research on free radicals and pulmonary medicine, I would concentrate on diversity, equity, inclusion and justice issues. The MAC is a perfect pairing with what I want to do professionally.

AS What was the rationale for the recent change in the committee's name from Minority Affairs to Maximizing Access?

SF "Minority" has a negative connotation. When you use the term "minority," it's almost implying that individuals choose to be minorities, even though this term has been imposed on them. I am an example. I never thought of myself as a minority until I moved to the continental U.S., and suddenly, I was classified as a minority or whatever moniker was popular at the time.

Maximizing access includes not just different ethnicities but also people with disabilities, the LGBTQ+ community and first-generation college attendees. The National Institutes of Health has expanded the definition of underrepresented individuals, and after consideration for almost two years, the MAC decided to change as well.

AS Diversity and inclusivity are at the forefront of many conversations today. How has this impacted the MAC and the society?

SF I think it has changed things quite a bit. An example is the move by the ASBMB to infuse diversity, equity, accessibility and inclusion, or DEAI, into all of the committees. I think the MAC has influenced this. Together with Ciearra Smith, the society's manager of DEI programs, the MAC plans to help spearhead the incorporation of DEAI into the strategic plans of other committees.

I really like the direction the ASBMB has taken. Diversity should not be something that only the individuals in the MAC care about — everybody should care.

When you look at the sessions at the society's annual meeting, clearly there is a lot more diversity than 10 to 15 years ago. There are intentional actions by all ASBMB committees and organizers to pay attention to diversity and gender balance. I am very happy that this is happening across the society.

AS The 2023 annual meeting is approaching rapidly. What sessions has the MAC organized for #DiscoverBMB?

SF The sessions organized by the MAC at each annual meeting fall within the framework of biochemistry and molecular biology but with a twist toward health disparities. This year, the focus is on the inherent biases in data sciences and in coding. An example is facial recognition software that can't differentiate between individuals if they have darker skin color. The individuals who coded the computer failed to account for the many different shades of skin color.

Similar to the documentary film "Coded Bias," our focus will be on "bias in, bias out." In the first session, Mahzarin Banaji, one of the developers of the Harvard Implicit Association Test, will talk about biases in general. This session, a joint activity with the ASBMB's MOSAIC (Maximizing Opportunities for Scientific and Academic Independent Careers) program, will be led by MAC member Ruma Banerjee. The subsequent sessions, organized and chaired by MAC member Allison Augustus–Wallace, will be about bias in coding, especially when using genetic information and genomic information to make inferences about susceptibility to diseases.


ASBMB

Ann Stock (left) and Sonia Flores (right) are pictured with Tracy Johnson, recipient of the 2022 Ruth Kirschstein Diversity in Science Award, and past president Toni Antalis at the ASBMB 2022 annual meeting in Philadelphia. The Maximizing Access Committee selects the winner of this award.

AS One of the events that I most enjoy at the annual meeting is the MAC reception. What can we look forward to this year in Seattle?

SF The MAC reception provides an opportunity for all meeting attendees to network with our Graduate Student Diversity, Equity and Inclusion travel awardees and MOSAIC scholars. The DEI travel awardees will present posters during the reception. This year, we will also highlight the 10 recipients of our Marion B. Sewer Distinguished Scholarship for Undergraduates.

The MAC reception will be held in the exhibit hall on Saturday evening, at the end of the first day of the meeting; it has been scheduled to avoid conflicts with other receptions. We anticipate a large turnout for this event, which has a tradition of high energy, great conversation and delicious food. I look forward to seeing you there!

Ann Stock (stock@cabm.rutgers.edu) is a professor of biochemistry and molecular biology at the Robert Wood Johnson Medical School at Rutgers and resident faculty member at the Center for Advanced Biotechnology and Medicine. She became the ASBMB's president in July.

Endowed chair, lecture named for Bryant

When he announced his retirement after 41 years of teaching and research at Penn State, Donald Bryant made a pricey and impactful promise: His estate one day will give $2.1 million to the school to support both an endowed chair and a lectureship in his name.

BRYANT

Raised on a dairy farm in Kentucky, Bryant's interest in science was piqued early on. His scientific life began in earnest in 1972, when he graduated with a bachelor's degree in chemistry and biology from the Massachusetts Institute of Technology. He went on to earn a Ph.D. in molecular biology under the direction of Alexander N. Glazer and Frederick A. Eiserling at the University of California, Los Angeles.

After completing postdoctoral studies at the Pasteur Institute in Paris and Cornell University, Bryant joined the Penn State faculty in 1981. Over the years, he has had additional appointments at Montana State University and Nanyang Technological University in Singapore and completed various domestic and international sabbaticals.

Bryant took a shine to photosynthesis as an undergraduate, and that fancy never faded. His lab has been dedicated for decades now to determining the ins and outs of bacterial photosynthetic apparatuses.

"I've been doing research in this field for exactly 50 years," Bryant said in a press release. "As I retire, I want to help ensure that there is a long-term presence of microbial physiology in my department, and having an endowed position for a senior-level researcher is an important part of that. I know from my own experience how important an endowed position can be for recruiting and retaining the best faculty and for giving them the resources they need to be creative and productive."

The lectureship included in Bryant's bequest also will focus on microbial physiology as he did throughout his career.

Bryant, a member of the American Society for Biochemistry and Molecular Biology since 1988 and a two-term editorial board member for the Journal of Biological Chemistry, has been a prolific author and mentor, with more than 450 publications and about 100 students and postdocs trained.

"There's an old saying that if you can help establish one person in your field then you are doing better than average, and I've got quite a few more than one," he said. "I've really enjoyed it, and all my awards and successes through my career really come down to the people I've gotten to work with. Being able to continue to have an impact through these gifts in my retirement is really very satisfying."

Serio promoted again at UMass Amherst

Tricia Serio in July became the University of Massachusetts Amherst's new senior vice chancellor for academic affairs and provost.

SERIO

Serio studies prions. Her lab uses biochemical, imaging and mathematical modeling approaches to understand the initiation, accumulation and clearance of protein aggregates.

After earning her Ph.D. at Yale University and completing a postdoc at the University of Chicago, Serio started her faculty career at Brown University, went on to become a department head at the University of Arizona and then joined UMass in 2017. There she has served as dean of the College of Natural Science and associate chancellor for strategic academic planning.

Serio has been an active member of the American Society for Biochemistry and Molecular Biology community, serving on the Public Affairs Advisory Committee and advocating for research funding, workforce equity and science literacy.

Tolbert named HHMI's first VP of science leadership, culture

The Howard Hughes Medical Institute tapped Blanton Tolbert in September to serve as the organization's inaugural vice president of science leadership and culture. He is tasked, according to a press release, with developing and directing the HHMI's future Center for the Advancement of Science Leadership and Culture. That center, set to launch in November, will house existing and new education programs, a culturally aware mentorship initiative, and a "curriculum that helps HHMI scientists grow their skills in lab management, values-based leadership, scientific rigor, and other valued subjects to maintain inclusive environments."

TOLBERT

Tolbert earned his Ph.D. from the

ASCB honors Asai, Goley and Bagde

Three American Society for Biochemistry and Molecular Biology members won recognition from the American Society for Cell Biology: David J. Asai at the Howard Hughes Medical Institute, Erin Goley at the Johns Hopkins University School of Medicine and Saket Bagde at Cornell University.

Asai won the Bruce Alberts Award for Excellence in Science Education. He has been the senior director for science education at the HHMI since 2008. His team runs programs supporting science education at the pre-college, undergraduate and graduate levels. Before he joined the HHMI, Asai taught, conducted research and held leadership positions at Harvey Mudd College in California and Purdue University in Indiana. He is an elected fellow of the American Association for the Advancement of Science and of the ASCB.

ASAI

Goley gave the LGBTQ+ keynote speech at the ASCB meeting. She is an associate professor and director of admissions for Hopkins' graduate program in biochemistry and cellular and molecular biology. Her lab uses cell biological, biochemical, genetic and structural approaches to study bacterial growth mechanisms and antibacterial resistance.

GOLEY

Bagde was one of two winners of the ASCB's Porter Prizes for Research Excellence. He is a Ph.D. candidate in the Cornell lab of Chris Fromme. The Porter Prize recognizes Bagde's recent work on deciphering how the GTPase Rab11, a protein switch that functions in membrane trafficking, the postal service of the cell, is switched on by its activator, the TRAPPII complex. He also won the Spicer Young Investigator Award from the Stanford Synchrotron Radiation Lightsource in September; that award recognizes his determination of the entire structure of the protein complex called polyketide synthase, which is involved in the biosynthesis of antibiotic natural products. Bagde earned his bachelor's and master's degrees from the Indian Institute of Science Education and Research, Pune, and conducted his master's thesis research at the University of Texas at El Paso.

BAGDE

University of Rochester and was an HHMI postdoctoral fellow at the University of Maryland, Baltimore County, before starting his faculty career at Miami University in Ohio. In 2012, he joined Case Western, where he ran a lab focused on RNA virus replication and served most recently as the vice dean for diversity, equity and inclusive excellence and as the associate director for DEI at the Case Comprehensive Cancer Center.

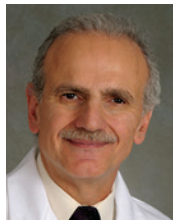
In the release, Tolbert said of his new role, "I get to combine my passions for scientific excellence, training, and cultural innovations to expand the biomedical workforce with talented individuals from diverse and marginalized backgrounds."

New phase for Hannun

Yusuf Hannun is stepping down as the Stony Brook Cancer Center's leader after a decade of service. He'll remain the center's director until a replacement is named, and after that he'll continue to run his lab as a faculty member.

A clinician–researcher, Hannun as a postdoc at Duke University discovered a biological activity for the lipid sphingosine. Since then, he has led a team that investigates the roles of sphingolipids in cell signaling, programmed cell death and carcinogenesis, first at Duke and then at the Medical University of South Carolina, where he also held administrative positions, and later at Stony Brook, which recruited him in 2012.

Hannun has earned many accolades, among them election as a fellow of the American Association for the Advancement of Science, honorary degrees and international prizes, and a lifetime achievement award, which he shared with his late physician–scientist wife, Lina M. Obeid, who was his scientific partner. Hannun is highly published with an H index of 149.



HANNUN

An active member of the American Society for Biochemistry and Molecular Biology for more than three decades, Hannun won the society's 2011 Avanti Award in Lipids and was named an ASBMB fellow in 2022.

Albert E. Dahlberg

Albert E. Dahlberg, a professor of medical science at Brown University and a member of the American Society for Biochemistry and Molecular Biology for more than 35 years, died March 1. He was 83 and suffered from cerebrovascular disease.

Born Sept. 19, 1938, in Chicago, Dahlberg spent his childhood weekends and summers on a family farm in rural northwest Illinois. He received a bachelor's degree from Haverford College and earned both an M.D. and a Ph.D. in biochemistry from the University of Chicago.

During the late 1960s, Dahlberg served in the Public Health Service at the National Institutes of Health. While living in the Washington, D.C., area, he and his wife participated in the first White House vigil to protest the Vietnam War. In 1970, they moved to Aarhus, Denmark, so he could do postdoctoral research with Niels Ole Kjeldgaard. This is where his interest in bacterial ribosomes was sparked.

Brown University hired Dahlberg in 1972. He was appointed to full professor in 1982 and named biochemistry chair in 1984. He remained at Brown for 43 years and also served as a visiting professor at the University of Wisconsin–Madison, the University of Copenhagen and the University of New South Wales in Sydney, Australia.

Dahlberg's research focused on understanding the catalytic role of ribosomal RNA in protein synthesis. His lab studied numerous regions of E. coli 16S and 23S rRNA through site-directed mutagenesis to decipher the structure and the dynamic aspects of ribosome function. He expanded his work in E. coli to Thermus thermophilus, a Gram-negative bacterium used as a source of thermostable DNA polymerase and as a model organism for genetic manipulation and systems biology.

Guided by the crystallography of the 30S and 50S ribosomal subunits, his lab designed mutagenic strategies to understand tRNA selection, translocation, peptide bond formation and signal transmission between the ribosomal subunits. These methods have large-scale applications in understanding how antibiotics that affect protein synthesis function and gain resistance.

An avid Brown Bears football fan, Dahlberg enjoyed attending games and served as a football recruiter and faculty adviser to the team for many years.

He is survived by his wife, Pamela; a brother, Jim, and sister, Cordelia; three children, Albert and wife Hilary, Krista, and Paul and wife Becky; and six grandchildren.

— **Ankita Arora**

Donald Bruce McCormick

Donald Bruce McCormick, a pioneer in the nutrition field and a member of the American Society for Biochemistry and Molecular Biology since 1963, died April 21 at the age of 89.

Born Sept. 15, 1932, in Front Royal, Virginia, McCormick received his early education in Virginia and Tennessee. During high school, he took courses at the Oak Ridge Institute for Nuclear Studies (home of the Manhattan Project), which spurred his interest in science. He won the 1950 Westinghouse Science Talent Search for implementing autoradiography in a school project, and this helped him gain admission to Vanderbilt University for his bachelor's degree in chemistry. He continued at Vanderbilt, studying the xylulose/xylitol pathway, and received his Ph.D. in 1958 under the mentorship of Oscar Touster, the first chair of the university's molecular biology department. He then did postdoctoral research on vitamin B6 metabolism and pyridoxal kinases in Esmond Snell's laboratory at the University of California, Berkeley.

McCormick moved to Ithaca, New York, in 1960 to join the Graduate School of Nutrition of Cornell University. In a 2004 chapter in the Annual Review of Nutrition, he described his days at Cornell as "busy and productive." While there, he taught biochemistry and nutrition courses and received many honors, including a 1970 Mead Johnson Award and a 1978 Osborne and Mendel Award from the American Institute of Nutrition. In 1979, he moved to Emory University, where he served as a professor and chair of the biochemistry department for 15 years. After his retirement from Emory in 1999, McCormick and his wife, Jean, helped build the university's emeritus college to "to help maintain the scholarship of those who are still active and able," he wrote.

It was while serving as a consultant biochemist in the Interdepartmental Committee for Nutrition for National Defense survey in Spain in summer 1958 that McCormick developed his keen interest in vitamins. His research work focused on water-soluble vitamins and riboflavin chemistry and included biopolymer modifications, pathogen photoinactivation using riboflavin, and affinity studies of different enzymes and riboflavin-binding proteins. He published 320 research papers with 7,545 citations and served as a member and chair of many professional societies. He became the president of the American Institute of Nutrition in 1991.

McCormick loved nature and loved to travel around the world to experience wildlife.

He is survived by his wife, Jean; daughter, Sue; and sons Don, and wife Kristen, and Allen.

— **Swarnali Roy**

Connect with colleagues at an ASBMB conference

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

Upcoming ASBMB conferences

Discover BMB
March 25–28 | Seattle

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

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

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

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

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Upcoming ASBMB events and deadlines

FEBRUARY

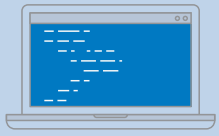
1	Deuel registration deadline
4	Honor society application deadline
14	Discover BMB housing deadline
24	PROLAB application deadline

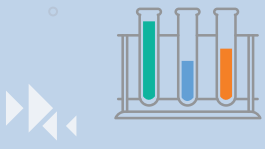
MARCH

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

APRIL

15	IMAGE workshop application deadline
21	Advocacy training program application deadline
30	Annual award nominations deadline





ASBMB

Neurodegenerative disease linked to microtubules

A team at McGill University reports a new role for sacsin, the protein mutated in a rare hereditary ataxia

By Laura McCormick

First characterized in Quebec in 1978, autosomal recessive spastic ataxia of Charlevoix–Saguenay, or ARSACS, is a hereditary neurodegenerative disease. Symptoms such as difficulty walking often appear in early childhood and continue to progress, limiting the mobility and lifespan of those affected.

In particular, ARSACS affects the cerebellum, the region of the brain that controls motor skills. It is the second most common recessive form of ataxia, or loss of muscle coordination and movement.

No cure exists for ARSACS, but in 2000, a team at McGill University identified mutations in the protein sacsin as its cause. Developing therapeutics is a challenge, however, because researchers do not completely understand sacsin's function. Although previously published work suggests sacsin may influence mitochondrial transport and function in neurons, its role in the cell is still unclear.

Vincent Francis, a postdoctoral fellow at McGill University, joined the laboratory of Peter McPherson because he was interested in neurodegeneration. In particular, Francis wanted to work on the understudied sacsin.

"I decided to pursue the project to understand the cellular function of sacsin, which could provide potential new therapeutic strategies for the treatment of the disease," Francis wrote to ASBMB Today.

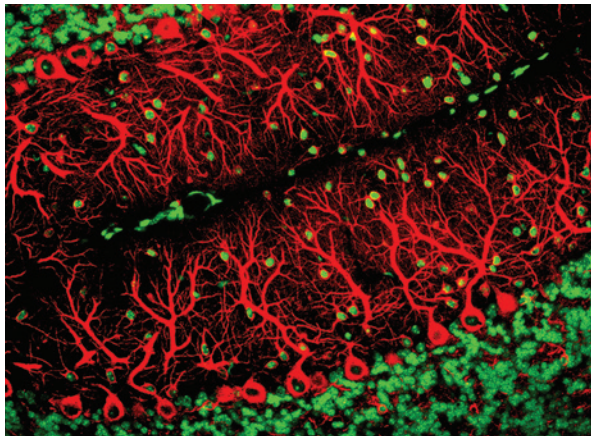
Previous work in the lab had focused on mitochondria, so Francis began looking at the transport of other organelles. He focused on the lysosome, the recycling center of the cell, where unwanted materials can be broken down and reused. Generally, lysosomes are clustered neatly around the nucleus. However, in cells without sacsin, lysosomes were scattered all around.

Lysosomes and other organelles are transported on microtubules. In neurons without sacsin, lysosomes move less. Based on their observations, Francis and the team hypothesized that sacsin could regulate the trafficking of cargo on microtubules.

"We assumed that sacsin could probably be functioning as an adaptor for organellar transport," Francis wrote. "Instead, what surprised us was the ability of sacsin to bind to microtubules and to modulate microtubule dynamics."

Microtubules are required for autolysomal reformation, a process in which new lysosomes are formed. Once again, without sacsin, cells showed a decrease in this process.

Because neurons are large, expansive cells, regulation of organelle trafficking is particularly important for their function.



YINGJIA MA & TIMOTHY VARTANIAN, CORNELL UNIVERSITY/NIH IMAGE GALLERY

Purkinje neurons, shown in red here, are nerve cells in the cerebellum.

This research, recently published in the **Journal of Biological Chemistry**, suggests sacsin is a key regulator of cellular traffic. In the future, the team hopes these results will inform research that can help identify treatments for patients with ARSACS.

Francis noted that several other neurological disorders — including Alzheimer's disease — are associated with decreases in neuronal microtubule stability. This indicates that microtubules may be a promising therapeutic target for ARSACS and other neurodegenerative diseases.

DOI:10.1016/j.jbc.2022.102320

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How Salmonella runs hot and cold

By Elizabeth Stivison

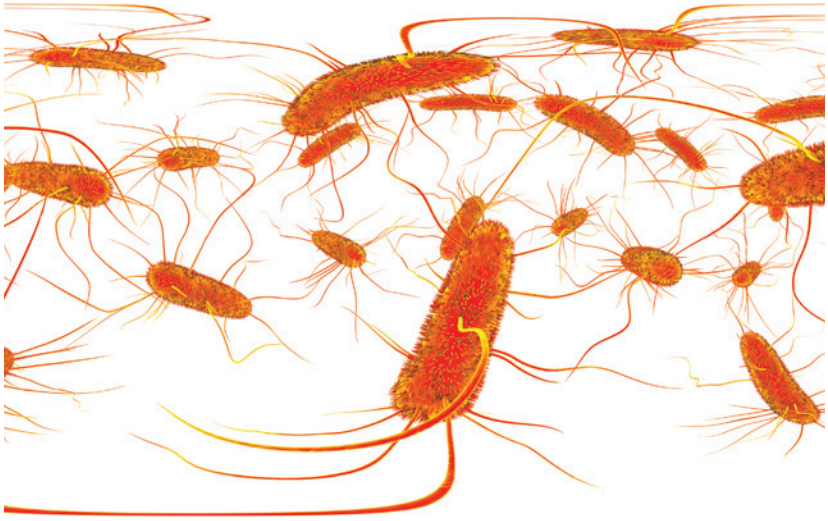
"Don't eat raw cookie dough!" is something adults often say to children. One reason we wash vegetables, cook meat and — usually — don't eat raw cookie dough is to avoid getting infected with pathogens like Salmonella.

As familiar as the name of this bacteria is, there's quite a bit we don't know about how it grows and spreads. One thing complicating our understanding is that Salmonella survives in disparate conditions. We have a handle on its life when it gets into our bodies, but it also must survive on crops in cooler outdoor temperatures and even in the fridge.

Researchers in Osnabrück, Germany, recently published a study in the journal **Molecular & Cellular Proteomics** about how the Salmonella proteome changes under different temperatures and nutrient conditions, opening the door to developing more efficient prevention techniques.

To understand how Salmonella survives, they grew it at temperatures from about as cold as a refrigerator up to as warm as a human body. They also varied the available nutrients. Then, after monitoring growth rate and other factors, they collected samples from all the growth conditions, extracted the proteins and analyzed them by mass spectrometry to get a picture of each one's entire proteome.

They found tons of data, which they've made available for other researchers, and started characterizing it with broad strokes. More pathogenic factors were expressed at body temperature. Heat and cold stress



response proteins changed across the conditions, as did proteins regulating gene expression and metabolism: Glycolysis is less efficient at colder temperatures, so the Salmonella may be upregulating their citric acid cycle to compensate.

When looking at the proteomic data for the cooler temperatures, they made unexpected finds, according to first author Laura Elpers. "It was a surprise to identify flagella," the long thin structures bacteria use like a propeller for locomotion, she said.

In E. coli, another common foodborne pathogen, flagella are expressed only at body temperature, not colder temperatures, and researchers thought it would be the same for Salmonella. "At first I thought, 'that cannot be,"' Elpers said. "I thought the proteomics was messed up, so we checked them."

Elpers stained her cells grown in cooler temperatures for flagella proteins and looked under a 100x microscope. "I was quite excited when I did the staining and could see the flagella," she said.

The team plans to look further into the flagella — it appears that they may be structured differently at cooler temperatures than at body temperature and may move differently. At body temperature, the team could see the Salmonella swimming around quickly, while at cooler temperatures the bacteria creep and crawl slowly.

"What is the flagella doing at the lower temperature?" asked Michael Hensel, the lead author. "The temperature is similar to conditions in agriculture — prior to climate change. It's a bacterial pathogen that hasn't been considered to be motile at that temp. But it may actually be able to reach new hosts and spread."

DOI: 10.1016/j.mcpro.2022.100265

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Do genetics determine if drugs help or harm?

By Sneha Das

We are all aware of the risks of elevated cholesterol in cardiovascular health, but it is also a lipid we can't live without. Our bodies require cholesterol to form cell membranes, steroid hormones and vitamin D. And the brain contains around 20%-25% of the body's cholesterol, which it needs to develop and function. So what happens when cholesterol synthesis in our brains is disrupted?

Károly Mirnics and his lab at the University of Nebraska Medical Center have long studied the molecular basis of brain disorders. Their recent paper on psychotropic medications that inhibit cholesterol biosynthesis in the brain was published in the **Journal of Lipid Research**.

"Cholesterol is synthesized by a cascade of events with multiple branches, but there is one particular molecule that is the direct precursor of cholesterol called 7-dehydrocholesterol, or 7-DHC," Mirnics said. "7-DHC is very unstable, falls apart very quickly, and is the most oxidizable lipid known to mankind."

An enzyme converts 7-DHC to cholesterol in the final step of the cholesterol biosynthesis pathway. In humans, the DHCR7 gene provides instruction to produce this enzyme, and mutations in this gene can cause Smith–Lemli–Opitz syndrome, or SLOS. Symptoms of this rare disorder, including growth and developmental delays, appear before or soon after birth. Elevated 7-DHC is a common molecular marker for SLOS.

"Around 10 years ago, several adult patients receiving commonly used psychotropic medications were misdiagnosed with SLOS based on their high 7-DHC levels," Mirnics said. "These patients did not have a mutation in the (DHCR7) gene, so we asked if it could be from the medications, and that started our research."

Aripiprazole, or ARI, an antipsychotic used to treat schizophrenia and bipolar disorder, and trazodone, or TRZ, an antidepressant, are commonly prescribed in the US. Psychiatrists often treat patients simultaneously with multiple drugs, but the side effects of these medications are not entirely known. So Mirnics and his group set out to investigate how they affect molecular and biochemical functions in the brain.

"I have to stress that our studies are all in mouse models, but the mouse cholesterol biosynthesis pathway is conserved across vertebrates, including humans," Mirnics said.

When the researchers treated cell cultures and genetically modified mice with ARI and TRZ, they saw that the combined therapy disrupted cholesterol biosynthesis in developing brain cells such as neurons and astrocytes. Adult mice treated with ARI and TRZ had elevated levels of 7-DHC — just like the patients who were misdiagnosed with SLOS.

Babies with SLOS must inherit two nonfunctional copies of the DHCR7 gene from each parent. Many more people, around 1%-3% of the population, are asymptomatic carriers with one mutated and one functional copy. Mirnics cautions that people with genetic mutations in the cholesterol biosynthesis pathway are most vulnerable to treatment with drugs like ARI and TRZ.

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"I am not saying these drugs are bad," Mirnics said. "But they may not be the best choice for individuals with genetic predisposition, or during pregnancy without knowing the genotype of the parents or the baby."

The lab is trying to catalog all commonly used medications that disrupt cholesterol biosynthesis. Mirnics expects this information will be useful for physicians, especially when prescribing drugs for patients with genetic predispositions. In the near future, this could be added to existing pharmacogenomics in which our genetics determine our drugs.

DOI: 10.1016/j.jlr.2022.100249

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From the journals

By Ken Farabaugh, Nivedita Uday Hegdekar & Andrea S. Pereyra

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

The plasma lipidome: Who contributes what?

More than 500 lipids circulate in the human blood, constituting what is known as the plasma lipidome. They serve as fuel to sustain cellular processes and act as signals as organs communicate. When the lipidome is altered by overeating, fasting, Type 2 diabetes or cardiovascular diseases, it becomes a useful diagnostic marker.

Various organs produce, secrete and take up lipids into and from the circulating blood to create the lipidome signature. However, we do not fully understand which organ contributes what under various physiological and pathological conditions.

In a recent article in the **Journal of Lipid Research**, Raghav Jain and colleagues from the University of Wisconsin–Madison and the University of Iowa describe how they exposed mice to low temperatures, which can rapidly induce lipid metabolism remodeling, and tracked over 1,000 species of lipids in plasma and in nine types of tissue, including cardiac and skeletal muscles, white and brown adipose, liver, and intestine.

When exposed to the cold, the white adipose tissue secreted free fatty acids into the blood, which then were taken by the liver. Here, fatty acyl chains were conjugated with L-carnitine to produce acylcarnitines, a lipid class that readily enters the mi-

The timing of lipid metabolism

The liver is a hub of lipid metabolism, with hepatocytes regulating uptake, esterification, oxidation and secretion of fatty acids and lipid droplet storage. Disruption of the molecular clock (a transcription- and translation-based feedback loop) or metabolic/redox oscillator (which drives oxidation–reduction cycles of reactive oxygen species and lipids), two circadian timing systems that regulate behavioral and physiological processes according to a 24-hour light/dark cycle, can cause metabolic imbalances leading to fatty liver, dyslipidemia, glucose intolerance and an increased risk of cancer. However, little is known about how disruption of the intrinsic clock mechanistically alters metabolic pathways.

PIXABAY

In a recent paper published in the **Journal of Biological Chemistry**, Natalia Monjes and colleagues at the Universidad Nacional de Córdoba in Argentina describe their study that found that disruption of the Bmal1 gene, a key component of the molecular clock, dampened temporal patterns in lipid metabolism of tumor cells compared to control cells. This dampening of lipid processes was accompanied by severe decreases in endogenous triglyceride levels, lipid droplet accumulation and reactive oxygen species content. The authors also observed an increase in lactate levels, which could indicate a Warburg effect–like hypermetabolic state.

These results not only confirm the phenomenon of serum-synchronized molecular cycling in HepG2 cells but also indicate an effect of this cycling on lipid biosynthesis and, in particular, on the ratios of specific phospholipids. These findings also highlight a metabolic susceptibility of tumor cells to circadian disturbance, which could be used to improve chronotherapeutic efficacy.

DOI: 10.1016/j.jbc.2022.102551

— Ken Farabaugh

tochondria for energy production. In the cold-exposed mice, acylcarnitines served as fuel for the brown adipose tissue during thermogenesis. Furthermore, the authors found that the intestine was a novel site for uptake of acylcarnitines and that the kidneys contributed to their circulating pool.

This study provides lipid signatures for plasma and tissues and correlates them using a computational tool to predict tissue-specific contributions during metabolic stress. This could be important to understand how diseases change lipid metabolism.

DOI: 10.1016/j.jlr.2022.100197

Modifying actin assembly dynamics

The assembly and disassembly of the actin network is crucial for regulating many cellular processes, including cell motility, cell division and intracellular transport. The diversity of these actin networks is the result of a multitude of remodeling proteins and posttranslational modifications, which can fine-tune actin fiber nucleation and elongation. However, researchers do not know yet how N-terminal posttranslational modifications such as acetylation and arginylation, which may constitute only a small percentage of actin at the leading edge of cells and filopodia, can affect the properties of actin.

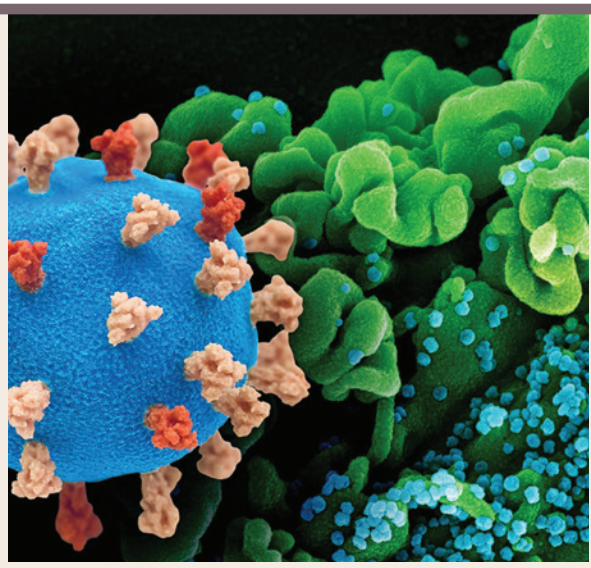
Samantha Chin at Washington University in St. Louis and an international team used a method known as "pick-ya-actin" to produce pure populations of acetylated and arginylated actin (Ac-actin and R-actin, respectively) to compare their contributions directly to actin network dynamics, and they describe this work in a recent paper in the **Journal of Biological Chemistry**. Using pyrene-bound actin (which fluoresces upon

The role of lipids in COVID-19

A surface glycoprotein on the SARS-CoV-2 virus known as the spike protein mediates interaction with surface receptors in the host cell and facilitates viral entry and propagation, which is crucial for COVID-19 infection to develop. Once inside, SARS-CoV-2 hijacks the cellular machinery required for its own replication. The newly formed viral spike proteins are the target of modifications including the covalent addition of fatty acids to cysteines of the protein aminoacidic sequence. This process is called S-acylation.

Almost three years into the worldwide COVID-19 pandemic, researchers still are learning about mechanisms of viral entry and propagation. Among them are Katrina Mekhail and Minhyoung Lee at the University of Toronto and Michael Sugiyama at Ryerson University (now Toronto Metropolitan University). Along with collaborators, they examined the role of spike protein S-acylation on human and monkey epithelial cells infected with SARS-CoV-2. Their findings were recently published in the **Journal of Lipid Research**.

The authors showed that S-acylation of the spike protein with palmitate, a 16 carbon–long fatty acid, was mediated by ZDHHC5 and other ZDHHC enzymes and was required for viral membrane-to-cell membrane fusion and virion spread in cell culture. They also found that other fatty acids, such as myristate and stearate, can be used for viral protein acylation by different enzymes.

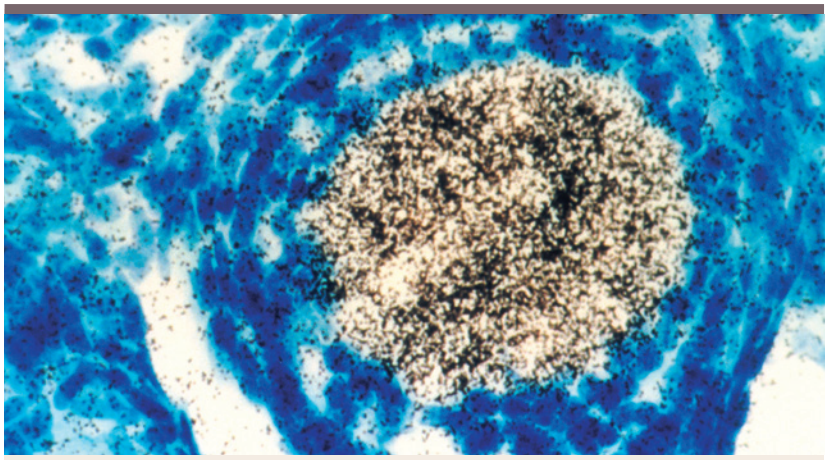


SARS-CoV-2 virus (blue) with its spike proteins (orange) interacts with a human cell (green).

To see how limiting endogenous fatty acid availability affects spike protein acylation and viral propagation, the authors used the drug TVB-3166 to block fatty acid synthase enzyme in cultured human cells and mice infected with coronaviruses that cause a respiratory illness similar to COVID-19. Inhibition of fatty acid synthesis reduced viral spread and clinical symptoms and improved survival.

DOI: 10.1016/j.jlr.2022.100256

— Andrea S. Pereyra



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Expression of oncogenes in cells downregulates antiviral pathways and type 1 interferon pathway proteins.

What do oncogenes regulate?

Oncogenes are genes that have the potential to cause cancer. Depending on the oncogenes' functional role, their mutations, overexpression or downregulation drive various forms of cancer in humans. And development of cancerous tumors results in massive multiomics changes. Researchers seek to understand these molecular changes to identify unifying hallmarks and broader drug targets more effectively.

Paige E. Solomon and researchers at the University of California, San Francisco, and the University of Wisconsin–Madison, studied these changes using a proteomics approach. Looking at isogenic cell lines with or without seven driver oncogenes, known as MYC, EGFR, HER2, AKT, KRAS, BRAF and MEK, they found that oncogene expression in each directly caused up- and down-perturbations in proteomes, compared to the corresponding cell line without the oncogenes. In particular, the researchers noticed strong and universal downregulation of several antiviral pathway and type 1 interferon pathway proteins including IFN beta, all of which are essential in regulating immune responses.

Oncogene expression also dramatically affected dsRNA sensing pathway proteins. However, dsDNA sensing proteins remained relatively unchanged, leading the researchers to predict that dsRNA sensing could have functional consequences that are distinct from the dsDNA sensing signaling pathways in cells expressing oncogenes. They found that cells expressing oncogenes have impaired dsRNA-sensing antiviral responses and increased susceptibility to RNA viruses. Their findings recently have been published in the journal **Molecular & Cellular Proteomics**.

As cells with oncogenes show increased susceptibility to RNA viral infection, researchers potentially could target tumors using virotherapy. Moreover, in many cancers, low interferon expression indicates aggressive and drug-resistant subtypes. Knowing that oncogene expression directly suppresses interferon proteins could help researchers develop therapeutic targets for aggressive forms of cancer.

DOI: 10.1016/j.mcpro.2022.100247

—Nivedita Uday Hegdekar

polymerization) and total internal reflection fluorescence microscopy, they showed that Ac-actin exhibits higher spontaneous nucleation than R-actin, and that R-actin exhibits reduced elongation and branching compared to Ac-actin. The authors found no difference in cofilin-mediated severing of Ac-actin and R-actin strands, suggesting the effects of these modifications are primarily on assembly rather than disassembly kinetics.

These data begin to highlight an emerging role for N-terminal acetylation and arginylation of actin in the regulation of actin networks.

DOI: 10.1016/j.jbc.2022.102518

Immunopeptidomics keeps teaching us

Immunopeptidome research originated with studies of the genetics of tissue transplantation, which showed that the major histocompatibility complex, or MHC, is a critical mediator of transplant survival. The MHC on immune cells, such as T cells, contains a set of genes that code for cell surface proteins essential for the adaptive immune system.

Based on the nature of the antigens presented to the MHC molecule, these T cells can distinguish between what researchers refer to as "self" and "nonself." Recognition is based on MHC class I proteins (which present endogenous antigens that originate within the cell) and MHC class II proteins (which present exogenous antigens, such as viruses and bacteria that are present in body fluids).

The immunopeptidome broadly refers to the peptides presented by MHC molecules on the surface of antigen-presenting cells to enable T-cell immunosurveillance. In a recent **Molecular & Cellular Proteomics** perspective article, Jonathan W. Yewd-

ell of the National Institute of Allergy and Infectious Diseases provides a comprehensive review of the past, present and future of immunopeptidome research. In chronicling the history of this field, he outlines the biochemical studies that explain the MHC class I–restricted nature of T-cell recognition, which ultimately culminated in seminal studies using mass spectrometry to characterize host cell class I–bound and class II–bound peptide ligands. He describes how MS has become a critical technique for defining MHC-associated peptides and understanding how peptides are generated from the antigen-presenting cells.

Yewdell also discusses future contributions of MS to the understanding of the MHC immunopeptidome. Increased MS sensitivity could characterize the immunopeptidome at the single-cell level, and future research could obtain quantitative data from MS studies and use the MS immunopeptidome to characterize contribution of antigen-presenting peptides to cellular processes and diseases. *DOI:10.1016/j.mcpro.2022.100230*

How Lyme disease evades the immune system

The complement cascade is a primary arm of the innate immune system, consisting of sequential protein cleavages that result in microbial death. However, some bacteria, such as Borreliella burgdoferi, which causes Lyme disease, have evolved outer surface-localized lipoproteins that help them evade complement-mediated attack. Researchers have identified two such proteins, termed ElpB and ElpQ, but have yet to understand fully the mechanism by which they inhibit the complement cascade.

In a follow-up study by Ryan Garrigues of East Carolina University and colleagues, published in the **Journal of Biological Chemistry**, the authors used multiple binding assays to show that the C-terminal domains of these Elp proteins were able to bind to complement protein C1s and block subsequent cleavage of the next sequential complement protein, C4. Furthermore, they found that this binding did not compete with C4 at the enzyme's active site but rather occurred at an activation-induced binding site called an exosite.

Based on these results, the authors propose a model in which ElpB and ElpQ exploit activation-induced conformational changes in C1s that normally would promote C4 cleavage to prevent this reaction and thereby inhibit the complement cascade. This study shows a novel molecular mechanism employed by Lyme disease spirochetes to evade immune attack. *DOI: 10.1016/j.jbc.2022.102557*

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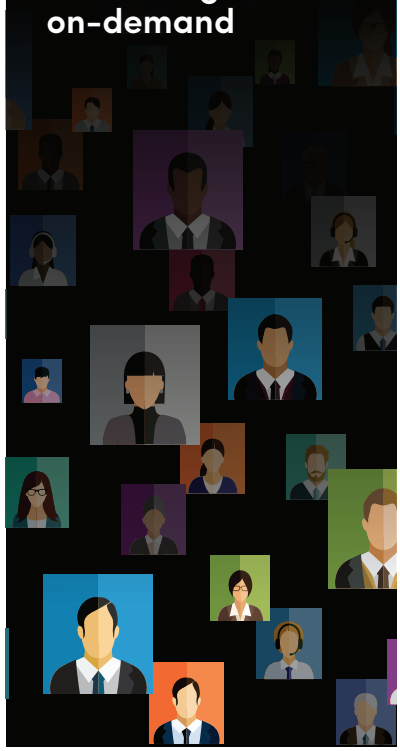

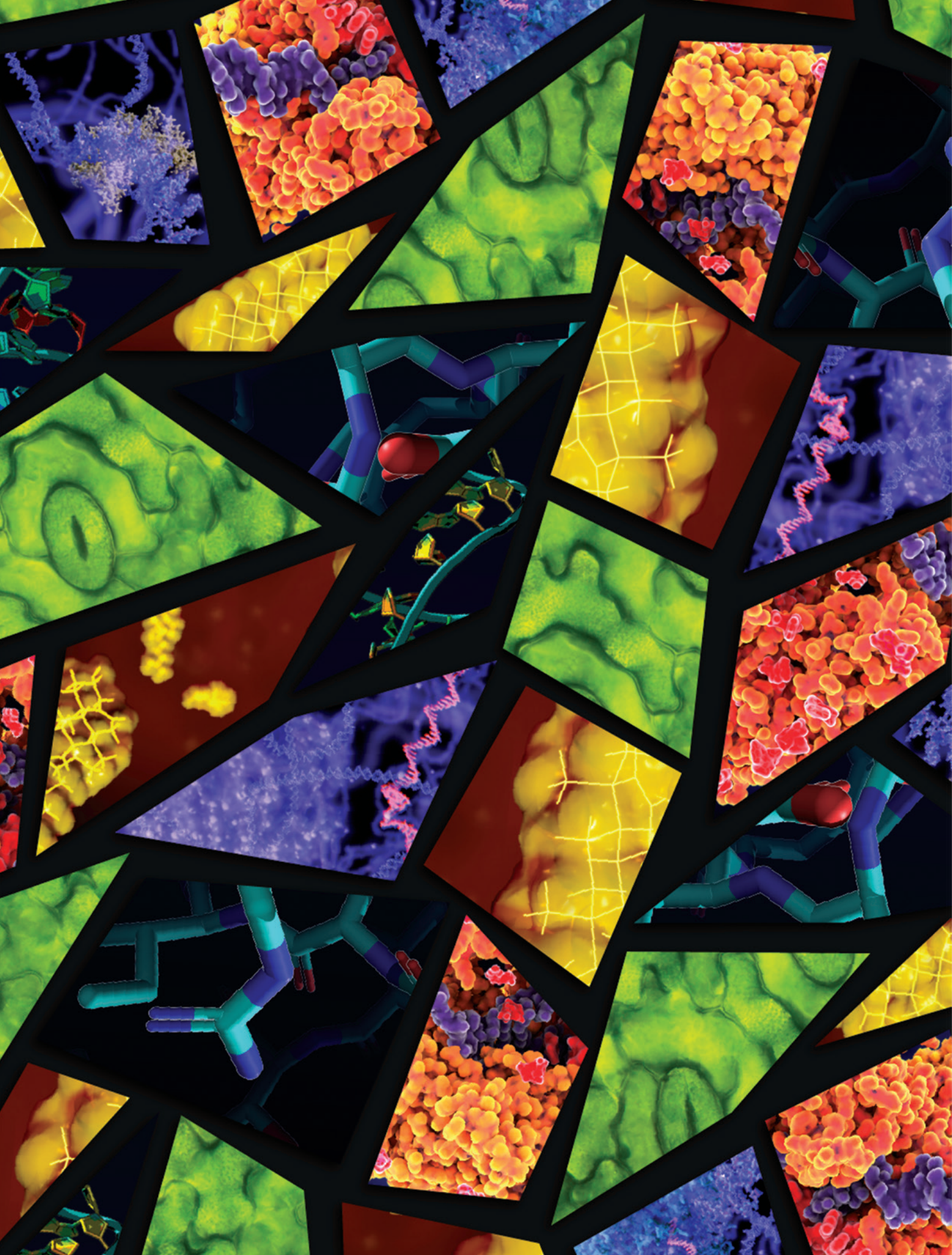

MOSAIC changes the landscape

This training program unites postdocs and professors with goals of diversity, equity and inclusion in academia

By Laurel Oldach

After she earned her Ph.D., Asiya Gusa spent several years as a stay-at-home mother and, later, as a high school science teacher. But she yearned to be back at the bench.

ASIYA GUSA

"I missed research a great deal," she said, "and my students and family challenged me to find a path back to pursuing my dreams."

Since 2018, Gusa has been back in the lab as a postdoc at Duke University. And last summer, she was at a suburban Maryland hotel, having dinner with a group of fellow postdocs, assistant professors and more-senior science faculty from around the country. Like Gusa, most of those present were people of color, and more than half were women.

This was the first in-person retreat of the Maximizing Opportunities for Scientific and Academic Independent Careers, or MOSAIC, program, which the American Society for Biochemistry and Molecular Biology runs in collaboration with the National Institute of General Medical Sciences. Funded since 2020 by several career-development grants, MOSAIC supports researchers committed to diversity in academia as they transition from postdoctoral fellowships into faculty positions.

Over dinner, the MOSAIC scholars and the professors who volunteer for the program chatted about issues common to their experience: how to address a student's disappointing performance, respond gracefully to casual prejudice from higher-ups, or handle the pressure and scrutiny of the academic job market.

MOSAIC scholars (floor) joined panelists Batsirai Bvunzawabaya, Cirleen DeBlaere and Carlota Ocampo (platform) for a session on race and mental health in academia during the 2022 ASBMB Annual Meeting.

ASBMB

Gusa was particularly concerned about that last point. Though she had been a MOSAIC scholar for only about six months, she was aware of the grant mechanism's tight timing requirements. It supports scientists

ASBMB

MOSAIC scholars Elizabeth Wasmuth (left), Cassandra Hayne, Chelsey Spriggs and Alfa Herrera applaud during a panel discussion at ASBMB's 2022 annual meeting.

for up to five years: two as a postdoc and three as a new faculty member. If a scholar doesn't secure an academic position within those first two years, the second phase is forfeit.

"I was very stressed out. The K99 is a fabulous award," Gusa said, naming the MOSAIC grant's NIH funding mechanism. "But … you feel very constrained within that first two-year period to find a position."

Gusa had reinvented herself professionally before, and she knew she had other options. Still, she really hoped to land a job as a professor.

A critical moment

"It's a critical moment in an academic career when you're transitioning between postdoc and faculty," said Christine Wood, a sociologist of science who evaluates the MOSAIC program. "Not so many of the programs to promote diversity and inclusion, or provide support to historically marginalized folks, have focused on that training stage."

Even after decades of federal programs designed to interest students from historically excluded backgrounds in scientific careers, all aimed at diversifying academic leadership by diversifying the talent pool, racial disparity among tenured professors remains a stubborn problem.

For Kenneth Gibbs, a program officer at the NIGMS who played a key role in developing MOSAIC, the problem is as personal as it is societal. His grandfathers, raised in the Jim Crow South, had fourth- and eighth-grade educations, but both of his parents, who grew up in public housing in Connecticut, attended college with support from a federal program.

"What I say often is that my life represents the multigenerational impact of public investment," said Gibbs, who trained as an immunologist and was a policy fellow at the American Association for the Advancement of Science before beginning his career at the National Institutes of Health. Along the way, he studied at institutions with strong track records on diversity, such as the University of Maryland, Baltimore County, and at institutions that continue to struggle with structural racism.

KENNETH GIBBS

"When I was at Stanford, there were more Black presidents of the United States than there were Black tenured basic science faculty," Gibbs said. Over time, he saw several former classmates of color, especially Black women, leave academia in response to bad experiences or lack of support.

Many Ph.D.s make similar decisions.

Wood said, "There's data that show high attrition (among) people that enter the postdoc space wanting to go into an academic career … even among historically well-represented scientists."

Statistics show that attrition is

highest among what demographers call underrepresented minority groups. Black and Native postdocs, in particular, are less likely to persist as professors than their historically well-represented counterparts. With that disparity in mind, MOSAIC was designed to offer extra support.

Funding postdocs and societies

The MOSAIC program combines two NIH award mechanisms: one grant to individuals and one to scientific societies.

The NIH developed the individual mechanism, called a K99/R00, about 15 years ago to help postdocs transition to faculty positions. Unlike the original K99 (sometimes called the parent mechanism), the MOSAIC K99 requires applicants to show a track record of working to increase diversity in academia.

Informal diversity, equity and inclusion work, which can include anything from mentoring young people to advocating for new departmental policies, often is taken on by scientists who have a personal stake in changing the culture. It frequently goes unrewarded.

The institutional grant sets MOSAIC apart from other career-development awards designed to foster diversity. It goes to scientific societies to organize cohorts of MOSAIC fellows and arrange discipline-specific professional development, networking, mentoring relationships and conference travel. So far, the ASBMB, the American Society for Cell Biology and the Association of American Medical Colleges are participating.

In designing the grant, Gibbs and NIGMS colleagues prioritized known barriers to career advancement — explicit and implicit bias, a sense of isolation, a lack of belonging and of networks — along with all the benefits that come with robust networking relationships, such as advice and back-channel comparison of opportunities.

"Everybody needs the same things," Gibbs said. "Everybody needs mentoring; everybody needs networking; everybody needs skills development. … Some get those things in the research environment, but some people don't."

Lillian Brady, a neuroscientist at Vanderbilt University who studies sex differences in dopamine signaling in response to nicotine, was preparing a parent-mechanism K99 grant application in October 2019 when she saw an announcement about the MOSAIC award. The opportunity appealed to her right away. She delayed her application for four months to enter the first MOSAIC review, added a statement on her advocacy for diversity to her application, and learned, roughly a year after applying for the grant, that she had received it.

LILLIAN BRADY

'If you build it, will they come?'

Gibbs and NIGMS colleague Paula Flicker dropped into the August MOSAIC retreat for a question-and-answer session on funding opportunities. After exhausting scholars' questions, they asked for feedback about the program itself.

Gusa raised her hand.

"I probably would not have applied for a K99 if not for MOSAIC. I feel like it spoke to me, specifically," she said. She wanted to know: Was that feeling widespread?

Absolutely, Gibbs replied. "I appreciate you saying that. That's the

The institutional grant sets MOSAIC apart from other career-development awards designed to foster diversity. It goes to scientific societies to organize cohorts of MOSAIC fellows and arrange discipline-specific professional development, networking, mentoring relationships and conference travel.

ASBMB

MOSAIC scholar Chelsey Spriggs (with microphone) speaks at the 2022 ASBMB Annual Meeting while panelists and fellow scholars (from left) John Jimah, Josefina Inés de Mármol and Alfa Herrera listen.

intention we had when we developed the program."

Gusa had hesitated to apply for a parent K99; she'd heard how competitive the grant was. More than a decade after earning her Ph.D., she returned to the lab as a postdoc with Sue Jinks–Robertson at Duke, studying how mobile genetic elements in Cryptococci influence their pathogenesis. She wasn't sure whether to try for a faculty role; she figured it depended on her ability to secure a grant.

When Jinks–Robertson forwarded her an announcement about MOSAIC, with its focus on underrepresented scholars and work similar to what she'd done as a science teacher and on a series of diversity committees, Gusa felt she would be a strong candidate. Receiving the award rekindled her dreams of becoming a professor.

MOSAIC has attracted a significantly more diverse pool of postdoc applicants than the parent K99 mechanism; about a third of K99 applicants have been female and roughly 7% from historically excluded ethnic and racial groups. As of September 2021, 76% of applicants for the MOSAIC K99 were women, and 77% were from historically excluded groups.

"The big question was, if you build it, will they come?" Gibbs said.

The answer was a resounding yes. "In the first round of MOSAIC," Gibbs said, "we had more Black applicants than we'd had (for K99s) in the previous two or three years."

The power of cohorts

Chelsey Spriggs is one of the first seven ASBMB MOSAIC scholars. Like Brady, when she heard about the opportunity from a friend, she already had a K99 application in the works. However, the program's focus on service and inclusion spoke to her because she was heavily involved in science outreach efforts — and so did the cohort model. "That appealed to me so much," she said. "I really was looking for a community of … postdocs thinking of staying in academia who were from underrepresented groups."

It's not that she was isolated, Spriggs said; she had plenty of professional contacts from her lab, fellow postdocs at her institution and grad school classmates. "But I was the only Black postdoc in my department," she said. "I have networks. But they don't look like the MOSAIC network, and they don't experience the world similarly to me."

Kirsten Block directs the ASBMB's education and professional development efforts and is principal investigator of its MOSAIC grant. "Seeing the community that the scholars have built for each other, and the bonds that they have built across departments, across disciplines, across institutions — it's really been special," she said.

KIRSTEN BLOCK

Asynchronous, remote networking was never part of the original plan for MOSAIC. But as the first cohort of scholars came aboard in February 2021, with much of the U.S. still practicing COVID-19 control, it was clearly necessary. Cohorts begin at four-month intervals, and each cohort runs a Slack channel that includes its scholars and their coaches. These channels have become a robust community where scholars discuss everything from day-to-day life in the lab to challenging work situations.

Ruma Banerjee can attest to how well-used they are. A professor at the University of Michigan Medical School, Banerjee is co-investigator of the ASBMB MOSAIC grant and a cohort coach for the first year's scholars. She accidentally disabled notifications from her MOSAIC Slack group during the 2021–22 winter holidays. In February, when she visited the channel to investigate the unusual silence, she found over 2,000 unread messages.

RUMA BANERJEE

The channels provide moral and practical support during what can be a grueling academic hiring process. Many postdocs tailor their research plans, diversity statements, teaching philosophies and cover letters to each of dozens of job openings — all while knowing that hiring committees receive hundreds of applications and that the odds of landing an interview, let alone an offer, are low. MOSAIC scholars read one another's application materials, watch and critique research talks, and commiserate.

Every month, each cohort meets on a Zoom call with a faculty mentor. At first, these meetings focused on topics related to diversity, equity and inclusion. But many of the scholars wondered if there was a better way to use the time.

"As a Black woman in academia, I am from a historically excluded background," Brady said. "Access to resources that support the professional development of myself and the other MOSAIC scholars will ultimately address many of the DEI-related topics that were the initial focus of the cohort meetings."

In response to such feedback, and to the time crunch of a transitional career stage, organizers reduced the meetings' frequency and reworked them to focus on professional development. It can be hard to select topics that appeal to a whole cohort, because — to organizers' surprise — by the time they entered the program, many members of the first cohort had job offers already in hand. Others had not yet begun to apply.

Reasoning that a new assistant professor may be less interested in a session on chalk talks in the hiring process than someone who is preparing an application, the organizers now offer training on federal funding, microaggressions, lab management and dealing with workplace conflicts, which they hope everyone can use.

'We interact very differently in this space'

Each scholar meets monthly with their coach, an established professor at a different institution who volunteers time to give advice and guidance. The coaches, all ASBMB members, include scientists who serve on the Maximizing Access Committee, which spearheaded the society's MOSAIC application.

The interaction between a supervising professor and a postdoc can be complex, weaving threads of collaboration, workplace hierarchy,

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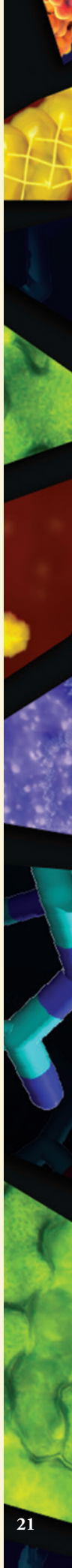
LILLIAN BRADY



In some cases, a MOSAIC coach is the first mentor a scholar has worked with who looks like them.

the specter of future competition, and questions about how a trainee's career will one day reflect on their former mentor and which research projects belong, intellectually, to whom.

"It can be really hard to disentangle and be fully behind supporting the trainee's independent research career when your own research program is on the line," said Alison Gammie, director of training, workforce development and diversity at the NIGMS.

The MOSAIC coaching relationship is designed to be less fraught. Coaches do not evaluate the scholars, compete with them or benefit directly from their achievements, and the two are based at different institutions.

ALISON GAMMIE

As a result of these differences, Banerjee said, the boundaries she maintains in her relationships with the postdocs in her research group are unlike those with her MOSAIC mentees. Speaking of both scholars and fellow coaches, she said, "We interact very differently in this space than any other scientific committee or community that I've been part of."

That difference is palpable on both sides. For scholar Elias Picazo, an assistant professor at the University of Southern California, his relationship with his coach, fellow chemist Vahe Bandarian, is the most valuable part of the program.

"Because the dynamics of the relationship are different, I can get a different perspective when asking for advice," Picazo said, adding that he's more comfortable asking Bandarian certain questions than some of his other mentors.

In some cases, a MOSAIC coach is the first mentor a scholar has worked with who looks like them. Spriggs, for example, specifically requested a Black coach because she had never had a Black scientific mentor. With her coach, Duke University professor Gustavo Silva, she talks frequently about the day-to-day challenges of setting up a new lab. Because Silva started his lab just five years ago, Spriggs said, he has a fresher memory of the details than some of her other mentors.

Spriggs and Silva also discuss what's known as the "diversity tax": the pressure professors from historically excluded groups often feel to take up more service work related to diversity and equity than their white peers, at the expense of research time. Withdrawing from this work altogether did not feel like an

COURTESY OF KIRSTEN BLOCK

During their in-person retreat in August, all of the ASBMB MOSAIC scholars in attendance posed for a group photo with NIGMS program officer Kenneth Gibbs (third row, second from left)

option to Spriggs.

"I learned to prioritize," she said. "I'm going to make time for the grad students, the postdocs and trainees, and then when it comes to working on other projects, or being on committees, I'll be a little more discerning."

No formal coursework

According to Block and Banerjee, within some broad NIGMS guidelines, scientific societies have had a lot of flexibility to design discipline-specific training in MOSAIC programs. "The programs have unfolded in ways that … tap into the resources that are available and reflect the people that are involved," Banerjee said.

At the ASBMB, Block said, the program offers an "a la carte menu" of professional development — such as the society's Interactive Mentoring Activities for Grantsmanship Enhancement grant-writing workshop, known as IMAGE, and the Journal of Biological Chemistry's early-career reviewer program — and diversity-focused programming including panel discussions on mental health and webinars on inclusive teaching. Scholars can choose to attend the offerings that work best for them.

Some of the training that organizers had hoped to offer at in-person meetings, such as an interactive workshop on laboratory management, had to be postponed or reimagined when the pandemic scrambled meeting schedules. However, most scholars said the societywide training activities aren't really the draw; they told ASBMB Today that they've gotten the greatest benefit from their coaches and peers.

Joining the professoriate

During the MOSAIC retreat in August, coaches presented hypothetical case studies on transitioning from postdoc to new PI. Would you agree to this risky collaboration with a senior colleague? Should you hire a postdoc with academic ambitions soon after founding your lab when their future research program might overlap or compete with your own? How would you handle competition with a former mentor?

As a transitional grant, the K99/R00 focuses on ensuring that awardees can succeed as faculty. In addition to the professional development and coaching from the ASBMB and other societies, the award requires certain assurances from a scholar's two home institutions, postdoctoral and professorial.

Institutional mentors must commit in writing to provide a supportive environment for a postdoc and agree in advance to the projects and research directions scholars take with them to launch their own labs.

As a recipient starts a faculty job, the grant provides for a lighter teaching load and some supplemental money for research. Before they make that transition, many scholars said, they lean on their MOSAIC coaches and fellow scholars for help with application packages, interviewing advice and employment negotiations.

With two children in high school, a husband in academia and a mother-in-law who recently moved to her area, Gusa often joked that she had more than the married academic's well-known two-body problem — she had a five-body problem on the job market. Earlier in her postdoc, she was offered a position at Dartmouth College but had to turn it down because she couldn't uproot her whole family from North Carolina to New Hampshire.

Gusa said that her MOSAIC coach, Sonia Flores, a University

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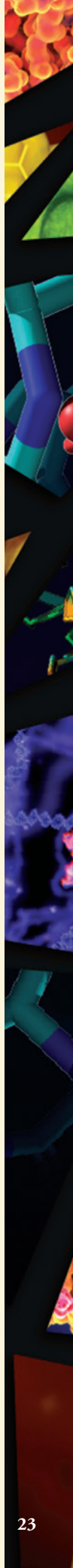
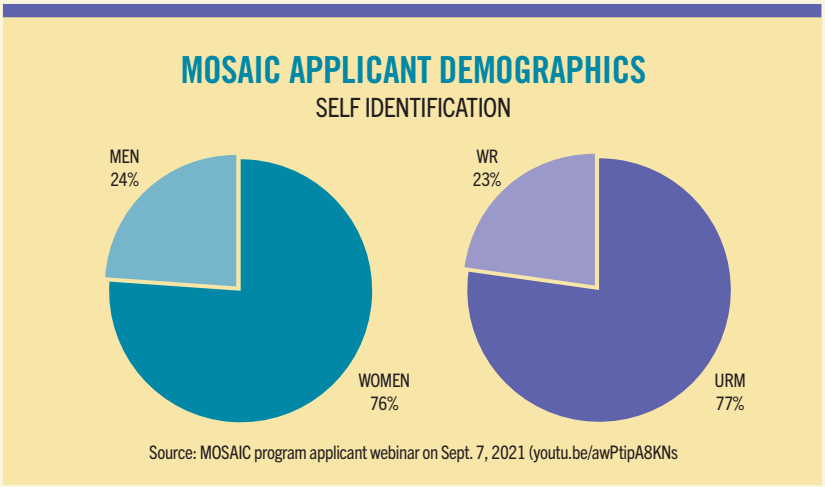




This chart shows the breakdown of the first mosaic applicants by gender and whether the scholars identify as underrepresented minorities or widely represented.

of Colorado professor and chair of the ASBMB's Maximizing Access Committee, was perfectly suited to help her with this dilemma. Flores, too, had been through a job search constrained by dual academic careers. As Gusa began her second year on the job market, she was concerned that she might not receive a viable offer, but Flores advised her against accepting a less-than-competitive offer. "I think she felt she had shortchanged herself during the negotiation because she was so grateful for the opportunity," Gusa said.

"I didn't want Dr. Gusa to feel that she should settle with a subpar offer just because she wanted to stay in the Durham area," Flores said. "I expressed to her that she should expect the same offer as anyone hired from outside the institution."

Scholars also have in their corner the NIH program officers, including those in the NIGMS Division of Training, Workforce Development and Diversity who manage their K99/R00 grants. Program officers review offer letters to make sure they comply with the R00 program's requirements. That can help when institutions try to recruit faculty members from historically excluded backgrounds at bargain-basement rates.

In at least one instance, Gibbs said, he and his colleagues counseled a MOSAIC scholar to decline a job offer of roughly 80% of the institution's usual starting salary and less than half the typical startup research support. It was not just a question of equity but also of realizing the federal government's investment in that person, Gibbs said. For someone unfamiliar with academic market rates, the package might have looked attractive, but the NIGMS staff saw at once that it was a lowball offer — and that, over time, it would likely have hindered the prospective hire's ability to do research comparable to their colleagues.

"Our goal is to optimize the chances of (scholars) being in an environment that's set up to be successful as they launch their independent careers," Gibbs said.

As the first MOSAIC cohorts begin to set up their labs, they also chat frequently about negotiating with vendors. Picazo, who started his lab at USC in 2021, likened buying laboratory equipment to purchasing a car. "Vendors don't list their prices," he said. "If they see us with an R00, are they likely to increase the cost of something, because they know there's liquidity?"

The Slack channel, with its lively exchange of background information on equipment pricing, lab budgets, institutional overhead and other considerations that are rarely part of postdoctoral training, is one of MOSAIC's most helpful features, Picazo said. He and his peers ask about topics that coaches say they didn't know about until five or 10 years into a faculty appointment. To Picazo, that's part of the point. Some postdocs have a chance to learn these details, sometimes called academia's hidden curriculum, early on; historically marginalized postdocs generally have not. The MOSAIC cohort alters that information imbalance.

"As soon as I learn something, I go to Slack, and I share it," Picazo said. "As soon as someone else learns something, they go to Slack, and they share it."

He doesn't know whether his ethnicity affected the information he was privy to before becoming a MOSAIC scholar. But, he said, "The fact is, I didn't have that network before. And I do have it now."

Changing the landscape

In September, Gusa accepted a tenure-track job at Duke University that will start in May. She posted right away on the cohort's Slack channel to thank her fellow scholars and coaches for their help.

"Asiya has a really exciting project in a niche she has created," Flores said. "She received a fantastic offer."

Gusa regards the MOSAIC award as career-changing, even life-changing, and said she's been spreading the word about the opportunity far and wide.

One challenge has been MOSAIC's runaway popularity. The NIGMS had forecast about 30 scholars by year 2, Gibbs said; instead, they've made 81 awards. The program has been adopted across the NIH; 22 of the NIH's 27 institutes and centers have joined, making the grant available to researchers from a wider range of scientific disciplines.

All 22 granting NIH organizations now are funneling scholars into the three approved societies, putting a strain on staff and volunteers. Two years in, the ASBMB is hosting 27 scholars — more than organizers expected to have in total after the program reaches steady state in five years. Block, Banerjee and the rest of the ASBMB MOSAIC team have scrambled to make sure each scholar can be matched to a mentor and to keep logistical operations running smoothly for nearly three times the expected number of participants.

NIGMS staff, meanwhile, are encouraging other scientific societies to apply to expand the program's capacity. "Leadership across all of NIGMS and all of NIH is very committed to this program," Gammie said.

Although these are early days, everyone involved seems to agree the program is a success. "Surprisingly, we are accomplishing some of our medium-term goals, even though we're in the short term — and that's because we have such a talented cohort of scholars," Banerjee said.

"When you make a fellowship seem more accessible to people who don't ordinarily see themselves as being successful K award winners," Gusa said, "it really changes the landscape of possibilities for your career."

HOW TO APPLY FOR A MOSAIC K99

While the MOSAIC program started at the National Institute for General Medical Sciences, 22 of the 27 NIH institutes and centers now participate in the mechanism, expanding its reach to many disciplines in the life and medical sciences.

Any postdoc can apply; the award is not limited by race or ethnicity. However, applicants must show a compelling commitment to increasing diversity and equity in the scientific workforce. An application must include both a strong research proposal and a statement illustrating commitment to diversity.

According to Kenneth Gibbs and Alison Gammie at the NIGMS, all the usual suggestions for preparing a strong grant application apply to the MOSAIC award; an applicant should reach out to a program officer before submitting an application, start early and make sure to have the application reviewed by a team of colleagues before submitting it.

Postdocs who would like to learn more can visit the NIH website and watch a recording of a September webinar for prospective applicants on the NIGMS YouTube channel.

Laurel Oldach (laurel.oldach@gmail.com) is a former science writer for the ASBMB. Follow her on Twitter: @LaurelOld.

‘That’s a legacy’

A remembrance of longtime NSF biochemist Elvira Doman

By Angela Hopp

Elvira Doman works at the bench in George Carman’s laboratory during her 1989 sabbatical at Rutgers.

Elvira Hand Doman was not a member of the American Society for Biochemistry and Molecular Biology, but she should have been.

Doman was a biochemist who spent the better part of her career leading National Science Foundation programs. She was a trailblazer, a lifelong mentor and a tireless volunteer.

But she came up at a time when scientific societies in general, and the ASBMB specifically, were exclusive. Members were elected, mostly male and mostly white. It wasn’t until the 1990s that the society saw the error of its ways and opened membership to the rest of the biochemistry and molecular biology community.

By then, though, Doman’s career was ending. She’d spent decades exposing young people to science, helping students navigate the halls of academia, coaching prospective grant applicants and supporting researchers lucky enough to have landed federal funding.

“There were so many people that she tried to help. She was always encouraging people,” said George Carman, who was mentored by Doman in the 1970s.

Doman, who died Oct. 7 at age 89, wasn’t a member of the ASBMB, but she embodied the values held today by the society, and her story is worth telling.

A gifted girl

Elvira Hand was born in 1933 and raised in East Harlem in New York City. Her mother, Lillian, tended to four children, and her father, Andrew, worked nights to support the family.

In a chapter of the 2006 book "Sisters in Science: Conversations with Black Women Scientists on Race, Gender, and Their Passion for Science" by Diann Jordan, Doman recalled that her attentive mother took her to get a library card when she was just 5 years old and that she became such a good reader she skipped kindergarten.

Doman was an honor roll student who took pride in excelling in math. ("Mathematics was supposed to be hard for females," she told Jordan.) She took lessons in dance — folk, interpretive and ballet — and voice at a nearby community center that today is called Union Settlement. Her piano playing landed her a performance at Carnegie Hall.

Doman decided during junior high to pursue science. "I came downstairs one morning and told (my mother) that God had spoken to me in a vision and told me to become a scientist. This incident is memorable in my mind because there weren't any scientists in the family or the community that I can recall," she told Jordan.

Doman said that going to Hunter College High School, a public college preparatory institution, made her confident in her ability to achieve. "I received the best public education that a poor person from the slums of New York City could obtain," she told Jordan.

She also trained at a charm school founded by Ophelia DeVore, who is credited with opening the modeling profession to Black Americans. The school turned out the first Black supermodel and many Broadway and television stars.

'Golden opportunity'

After graduating with high marks from high school in 1951, Doman majored in physical chemistry at Hunter College just a few miles away on Park Avenue. She served as a research assistant at the Sloan Kettering Institute when she was an undergrad, made the dean's list and graduated with honors in 1955.

In her interview with Jordan, Doman noted how fortunate she was to be in New York, where she had access to a free college education: "One had to have an average of B+ or A to be considered academically qualified for admission to the four city colleges. I would not have had the golden opportunity of a free college education had I been from somewhere else."

Doman returned to Sloan Kettering as a senior technician in 1956. She recalled in her interview with Jordan: "One day I discovered that my name was not listed on a publication, but the other technician, who was white, was listed. I had performed all of the calculations, laboratory work, etc. My supervisor's response to me was 'You don't have an advanced degree.' The other technician did not have an advanced degree either. My response to my supervisor was 'The next time you see me you will have to call me 'doctor.'"

Curious and caring

Doman earned a master's degree in molecular biology from New York University in 1959 and then moved to Columbia University, where, Jordan wrote, she became "weary of being told constantly that she was the first Black graduate student in biochemistry."

She earned a master's in biochemistry at Columbia in 1960 and then completed her Ph.D. in physiology and biochemistry at Rutgers University in 1965. (Her dissertation was titled "A study of NADH-cytochrome c oxidoreductase of beef heart.")

She returned to Sloan Kettering in 1965 for postdoctoral studies before moving to the Rockefeller University to become first a postdoc and then a research associate at the Population Council, which was housed on the

Elvira Doman moved to the Washington, D.C., area around 1977, when she became a volunteer in the public school system before settling in at the National Science Foundation, where she spent the rest of her career.

campus at the time.

Doman taught as a part-time lecturer at Douglass College, which was then the women's division of Rutgers, from 1970 to 1973 before becoming an assistant professor and the chief adviser for pre-med students at Seton Hall University, also in New Jersey.

Carman, now a Rutgers professor and the director of the Rutgers Center for Lipid Research, was a student of Doman's at Seton Hall.

"When I was a master's student, the first time that I did any independent research, she was down the hall," he said. "She would give me advice about doing biochemistry. She gave me encouragement and was friendly. She made me feel comfortable."

Doman, in fact, gave Carman a copy of her dissertation to use as an example when he was working on his, and she served on his master's thesis committee.

"What I didn't realize at the time," Carman said, "is that she must have had a very hard time there. It was very tense, and I had no idea how she felt as a woman. As I think back, it was all men."

But Doman kept her experiences to herself, Carman said. "She was not nurtured whatsoever. It was always an uphill battle, but she never complained to me. She never let on. Whenever I talked to her, she was always talking about how proud she was of me."

A new direction

In 1977, it seems, Doman was denied promotion and left academia. A proud product of public education, she chose to volunteer for the Washington, D.C., school system.

A year later, she joined the NSF as an assistant program director for the regulatory biology program. At the agency, she rose through the ranks, ultimately serving as program director for the integrative animal biology program within the Division of Integrative Organismal Systems.

She served on the NSF's Black history committee, acted as an equal employment opportunity counselor and organized research funding workshops.

Her 21 years of service at the NSF earned her several awards, including the Director's Equal Opportunity Achievement Award twice.

Role reversal

Doman and Carman stayed in touch as the years went on. Carman sometimes visited Doman when he was in town to serve on National Institutes of Health study sections. "We got to know each other playing tennis. She was competitive, but also very warm and nurturing," he said. He'd ask for her advice about research ideas and grant writing.

Doman even did a sabbatical as a visiting scientist in Carman's lab in 1989.

"I've had other people spend time in my lab, but it was kind of unique for me that she was my teacher," he said. "We reversed roles. She had not worked with lipids and the kind of stuff that I was doing and she learned all that stuff."

Carman added: "She befriended everybody. She had lunches at her apartment that she invited us to. She was always being good to students."

Decades of outreach

Doman led several initiatives, at the NSF and beyond, to increase participation in science by members of historically marginalized groups.

She was president of the D.C. Metropolitan Organization of Black Scientists from 1990 to 1993.

When Elvira Doman retired from the National Science Foundation, she remained involved with numerous mission-driven organizations. She was a lifetime member of the National Association for the Advancement of Colored People and continuously advocated for her alma mater, Hunter College, for example.

George Carman and Elvira Doman during her sabbatical at Rutgers. Carman recalled: "I've had other people spend time in my lab, but it was kind of unique for me that she was my teacher. We reversed roles."

In 1994, she helped organize an event put on by an organization called Minorities in Science and Technology. She told a Washington Post reporter in attendance, "Nobody in my family was a scientist and no one had exposed me to this opportunity. Now that I am a scientist, I would like to have others share my love of science."

Doman was a lifetime member of the National Association for the Advancement of Colored People and in 2000 won the Mentor of the Year Award from the University of Maryland at Baltimore County for her contributions to the Meyerhoff Scholars Program, which works to increase diversity in science, technology, engineering and related fields.

Still busy in retirement

Doman retired from the NSF in 1999, after 21 years, but continued her many service activities.

She sang in her church choir and had numerous volunteer appointments, some relating to science and others relating to her faith.

All along, Hunter College remained dear to her.

Shortly before retirement, she had become the recording secretary of the National Capital Area Chapter of the alumni association. In 2004, she sent a letter to Chemical & Engineering News thanking the publication for writing about the school. She listed her credentials and accomplishments, saying: "All of the above was accomplished by a person who was 'female, minority, and poor.' I am indeed grateful for having been a Hunterite."

In 2006, Hunter College inducted her into its hall of fame.

Exponential impact

Carman mentioned in his 2021 Journal of Biological Chemistry "Reflections" article that it was Doman who encouraged him to pursue a research career in biochemistry. He wrote, in part, "I can never repay my mentors for supporting my career, except to 'pay it forward' to my own mentees whether or not they receive formal training under my tutelage."

When Doman was eulogized in late October at the Peoples Congregational United Church of Christ, the officiant noted that tidbit while talking about Doman's impact over generations.

The officiant read from Carman's article, adding: "Dr. Doman poured into him, and her pouring into him encouraged him to pour into all of these other people that she would never meet. That's a legacy."

Doman was married twice and is survived by a daughter, a son and three grandchildren.

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

JLR session spotlights junior associate editors

By George M. Carman

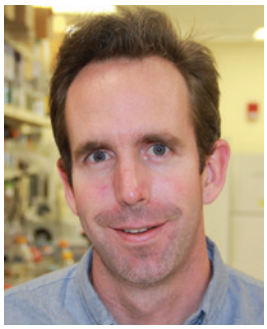
Discover BMB, the American Society for Biochemistry and Molecular Biology annual meeting to be held in Seattle March 25–28, will include a session featuring Journal of Lipid Research junior associate editors Michael Airola of the State University of New York at Stony Brook, Luke Engelking of the University of Texas Southwestern Medical Center and Renate Schreiber of the University of Graz.

These early-career investigators will share their lipid-based research in this session titled "Into the Lipidome: Spotlight on the Journal of Lipid Research Junior Associate Editors."

The JLR junior associate editor program, initiated by Co-Editors-in-Chief Kerry-Ann Rye and Nicholas Davidson, passes along knowledge of peer-review processes and trains the next generation of journal editors. The junior associate editors review original JLR submissions, gain experience with editorial decisions made by associate editors, and organize virtual issues and author review articles highlighting cutting-edge research in the field. Each junior associate is mentored by an associate editor.

The current group of junior associate editors also includes Scott Gordon of the University of Kentucky, Rebecca Haeusler of Columbia University and Judi Simcox of the University of Wisconsin–Madison. They presented their research at the 2022 ASBMB annual meeting in Philadelphia.

I invite you to read the following articles about Airola, Engelking and Schreiber and the exciting research they will present at Discover BMB on March 27 at the Seattle Convention Center.



MICHAEL AIROLA

LUKE ENGELKING

RENATE SCHREIBER

George M. Carman (gcarman@rutgers.edu) is the founding director of the Rutgers Center for Lipid Research, a Journal of Lipid Research associate editor and co-director of the ASBMB Lipid Research Division.

Seeking secrets of enzymes

By Nipuna Weerasinghe

Michael Airola was introduced to lipid research as a graduate student in Brian R. Crane's lab at Cornell University, studying bacterial receptors involving transmembrane signaling.

"This was when researchers who work with membrane proteins started using model lipid membranes like nanodiscs and paying attention to the effect of the lipid environment on membrane protein structure and function," he said.

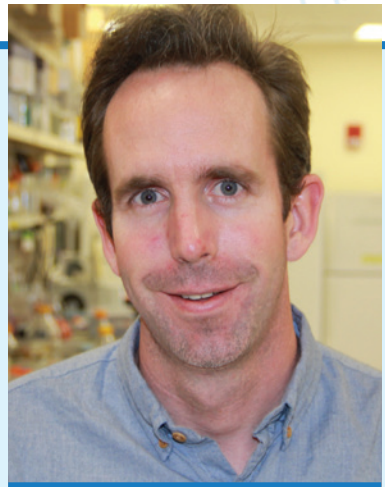
Airola's horizons widened when, for his postdoc, he moved to Yusuf A. Hannun's lab at Stony Brook University.

"Hannun is a pioneer in studying the enzymes involved in sphingolipid metabolism," Airola said. "He was interested in atomic details of how these enzymes work. … I brought structural skills and learned a lot about lipid biochemistry and techniques related to handling lipids and working with lipid membranes. Also, I got exposed to cell biology, animal work and drug development."

Lipids are cellular building blocks and essential to many cellular functions. They are closely associated with chronic disorders, including cardiovascular disease and diabetes, so learning about lipids is vital to improving human health. And that's what Airola continues to do as an assistant professor of biochemistry and cell biology at Stony Brook.

"Our lab is broadly interested in lipid metabolism and transport," he said. "We seek to understand the molecular details of these processes and develop new pharmacological and genetically encoded tools to monitor and control the generation of lipids in the cell."

During the COVID-19 shutdown, Airola helped start the American Society for Biochemistry and Molecular Biology's online Lipid Research Division Seminar Series, now attended each month by about 350 scientists. He is a junior associate editor of the Journal of Lipid Research, and he received the ASBMB's 2022 Walter A. Shaw Young Investigator of Lipid Research Award.



MICHAEL AIROLA

STUDYING STRUCTURE TO UNDERSTAND FUNCTION

Michael Airola's lab focuses on lipid-modifying enzymes, such as lipins, that are relevant to cancer, cardiovascular disease and fungal infections.

"We use structural biology techniques such as X-ray crystallography and cryo-EM coupled with an array of biochemical and cellular approaches in our research work," Airola said. "These works are complemented by computational methods such as docking and molecular dynamic simulations to gain a molecular level understanding of lipid metabolism and lipid signaling."

The lab tries to determine how these enzymes' structures allow them to recognize their unique hydrophobic substrates and interact with the membrane during catalysis and how these proteins are regulated through interactions with specific lipids or other protein effectors, he explained.

Airola's lab determined the first structures of human phospholipase D, a therapeutic target for cancer, and a lipin phosphatidic acid phosphatase that regulates fat storage as triglycerides. They are now developing inhibitors for fungal-specific lipid-modifying enzymes.

"I believe this work can make an impact in the real world in my lifetime to fight against the life-threatening fungal pathogen especially prevalent in hospital environments in the U.S.," he said.

During Discover BMB, the 2023 annual meeting of the ASBMB, in addition to speaking at the JLR Spotlight Session, Airola will discuss his work in the symposium on lipid dynamics and signals in membrane and protein structure.

Nipuna Weerasinghe (nipunawe@arizona.edu) holds a bachelor's degree in chemistry from the University of Colombo, Sri Lanka, and a master's degree in chemistry from the University of Arizona.

A safe harbor in lipids

By Renae Crossing

When Renate Schreiber was 17 years old, her mother suggested she take on a traineeship to become a research technician in biochemistry.

"By luck," she said. No one in her immediate family was a scientist. Her mother was an Austrian farmer.

These days, Schreiber climbs high Austrian mountains in her spare time. Reaching the summit, she is reminded of the rewards of writing a research paper.

She practices yoga and swing dances. "It frees my mind completely," she said.

And Schreiber, a senior scientist at the University of Graz, studies fat breakdown in adipocytes.

"Usually people think fat is just annoying," Schreiber said, but she describes neutral lipids in adipocytes as a "safe harbor." Without them, excess fatty acids would "overflow," she said, into tissues not specialized to store them: tissues in the liver and the heart.

After her traineeship, Schreiber's work as a research assistant (and, later, a visiting scientist) took her to labs in Sweden and the United Kingdom.

Working closely with postdoctoral fellows, including women who were successful in science at the turn of the millennium, motivated Schreiber to "change my path and go deeper into science," she said.

She returned to Austria to take her qualifying exams and entered university studies in biochemistry at the University of Graz, where she earned a master's and a Ph.D. and did her postdoctoral research before joining the faculty in 2019.

"Reach out to people," Schreiber advises, knowing a single conversation can yield fruit in abundance, a safe harbor, an overflow.

RENATE SCHREIBER

LOSING LIPOLYSIS

An enzyme that breaks down lipids is called a lipase, and the breakdown process is called lipolysis. Renate Schreiber studies adipose triglyceride lipase, or ATGL, which breaks down triglycerides in fat cells.

Without this enzyme, fatty acids (not the overflowing ones, just the standard amount needed for energy or for the waggly tails in a cell membrane) couldn't be released; they'd be trapped in storage.

It would be like losing the combination to unlock your bike.

Mice given a drug to inhibit ATGL are forced to keep their lipid bike on lock, research by Schreiber and others showed in 2017. This was predicted by her earlier work in 2015. Paradoxically, the mice don't become obese even when fed a high-fat diet. For one thing, mice with reduced triglyceride breakdown respond by reducing triglyceride synthesis.

Think of it like this: If you could no longer unlock your bike, you'd stop locking it in the first place.

Schreiber suggests that shutting off lipolysis in the white adipocytes tested could be a key to treating obesity and metabolic disorders. Her lab is onto it.

Schreiber wrote the story of ATGL — its discovery and its manipulation in mice and in people — in the 2019 review "Of mice and men: The physiological role of adipose triglyceride lipase (ATGL)."

White adipocytes are specialized for storage; brown ones keep us warm.

Schreiber finds it interesting that, in deleting ATGL in brown adipocytes, mice maintain normal body temperature and nonshivering thermogenesis; this challenges dogma. Lipolysis has been considered essential for thermogenesis. Is it?

At Discover BMB, Schreiber will discuss what happens to thermogenesis when both ATGL and its protein partners are pinned down.

Renae Crossing (renaecrossing@gmail.com) is a writer and former teacher. She holds a first-class master's degree in life science from the Hong Kong University of Science and Technology and a first-class master's in teaching from the University of Melbourne. Follow her on Twitter: @renaecrossing.

Balancing research and medicine

By Ken Farabaugh

When he was young, Luke Engelking's mother asked him what he wanted to be when he grew up. His answer? "'A mad scientist,'" he said.

Engelking certainly was exposed to the idea of a career in science and medicine early, as his mother pursued a second career as a physician's assistant during his high school years. "Unfortunately, she had a number of rare autoimmune diseases and was often in and out of doctors' offices," Engelking said. "From then on, I always knew I wanted to go to med school. However, I wasn't always certain that I wanted a Ph.D."

Engelking ended up doing both. He went to medical school at the University of Texas Southwestern Medical Center, where he got his M.D.–Ph.D. in the lab of Nobel laureates Michael Brown and Joe Goldstein, best known for their discovery of the low-density lipoprotein receptor and its regulation of cholesterol metabolism. He enjoyed working with Brown and Goldstein.

"It was a very productive time," Engelking said. "I really didn't appreciate working under their aegis when I was doing it. … Once you're out on your own, everything is more of a struggle."

Engelking has embraced that struggle. After a residency at Massachusetts General Hospital and a clinical and research fellowship back at UT Southwestern, he not only began seeing patients as an attending physician but also opened his own research lab as an assistant professor in the departments of internal medicine and molecular genetics, studying the role of sterol receptor element-binding proteins in colon cancer growth and progression.

Now an associate professor, Engelking balances his time between seeing patients and conducting research. In addition, he is working to establish a clinical research program in colon cancer genetics so data on mutations of enrolled patients can be made publicly available to researchers at UT Southwestern and around the world.

"It's my hope that we'll be able to synergize the clinical work with the work going on in the lab," he said. "It's a challenge to try to get all of this work to align — I hope I'm making progress, but we're not quite there yet."

LUKE ENGELKING

IDENTIFYING MARKERS OF CANCER CELL PROLIFERATION IN THE INTESTINE

As a physician, Luke Engelking practices adult gastroenterology, focusing on patients with inherited mutations that lead to colorectal cancers as in Lynch and familial adenomatous polyposis, or FAP, syndromes.

In the Engelking lab, research focuses on the roles of lipids in intestinal epithelial cell growth. The lab uses Cre-lox and CRISPR tools to alter gene expression, RNA-seq and lipidomics to profile cell markers, and intestinal organoids from both humans and mice as model systems.

The researchers hope that discovering novel mechanisms by which sterol receptor element-binding proteins, or SREBPs, regulate tumor cell growth and proliferation will present new drug targets for the treatment of colon cancer. Recently, the lab demonstrated that selective loss of SREBP-2, which blocks cholesterol synthesis, leads to overgrowth and increased proliferation of intestinal progenitor cells.

"What I really hope to do is move toward patient-oriented studies," Engelking said. "Perhaps we'll find patients with FAP phenotypes but unknown genetic markers. There are any number of genetic unknowns that impact underlying cancer biology."

Ken Farabaugh (kfarabaugh@asbmb.org) is the ASBMB's science editor.

How do we know what students know?

Regional workshops aim to build an inclusive community focused on assessment

By Daniel Dries, Jenny Loertscher & Victoria Del Gaizo Moore

When the American Society for Biochemistry and Molecular Biology began accrediting undergraduate biochemistry and molecular biology programs in 2013, no one knew quite what to expect. Would colleges and universities be interested? What would they want from such a program? Could the ASBMB support accreditation? How would we assess student outcomes? Who would write the questions and score the exam?

In the decade since we started, we've gotten answers to some of these questions — and we've started to ask new ones: How can we attract more educators to support this program? And how can we ensure that these educators reflect and represent students and schools in historically marginalized and underserved communities?

We're working on answering those questions now — but first a bit of history.

The ASBMB offers its accredited undergraduate science programs the option of certifying students' BMB degrees based on proficiency on a national certification exam. The exam assesses students' skills and knowledge in four core concept areas. It has been offered at more than 90 programs over the years, and more than 1,000 students took the exam in spring 2022.

To create, administer and score the exam, the ASBMB has relied on more than 100 volunteers from its education community. We are three of those volunteers.

With funding from the National Science Foundation, workshops were held around the country to identify our four foundational concept areas. Workshop participants and organizers — and other BMB educators — convened in the early 2010s to draft the first ASBMB certification exam. We decided the exam should include just a few critical-thinking questions — some multiple-choice, some open-ended — that covered the four core concept areas.

As the program grew, we needed more help writing a new exam each year as well as pilot questions for subsequent exams. We realized that anyone writing questions for the exam would need to be trained. The ASBMB hosted ad hoc training sessions at its annual meetings and summer education meetings to meet the rising demand. After several years, we knew there had to be a more sustainable way.

The solution was a workshop series on developing assessment questions.

A pilot in Georgia

Over the years, question writers and exam scorers often praised the rich collegial network that grew up around working on these assessments. They also noticed that, by extension, their own classroom assessment practices had transformed. Seeing opportunities to expand this community and transform undergraduate education, we planned a two-day workshop to pilot a program focused on learning how to create BMB assessments.

As we debated where to hold this workshop, we realized our existing community was remarkably homogeneous. Most of us work at colleges and universities where the students and faculty are primarily white. Thus, we had to reckon with the fact that our certification exam replicated the homogeneity of our community, which had led to homogeneity in our leadership.

To write an inclusive national certification examination, we needed to intentionally engage colleagues who look like our increasingly diverse BMB student body and who teach at institutions that serve student populations who are historically underrepresented in BMB. We needed to begin with our workshop.

We asked Kim Cortes at Kennesaw State University in Georgia, a state rich with historically Black colleges and universities, to be our inaugural host. The pilot workshop drew 28 participants from 21 institutions, more than half of which enroll a significant percentage of students from historically marginalized groups, with 68% of the participants teaching

at what are referred to as minority-serving institutions.

In follow-up surveys, 92% of respondents said the workshops increased their confidence in writing high-quality assessment items. And all respondents said the workshop promoted an inclusive environment where everyone was encouraged to participate.

We are now building on that success.

Building an inclusive community

We now have a five-year NSF grant to launch Inclusive Community for the Assessment of Biochemistry and Molecular Biology Learning, or ICABL, a series of workshops intended to build a diverse network of BMB scientist–educators who prioritize high-quality assessment. Focused on undergraduate education, ICABL is committed to using evidence-based methods to develop assessments.

Our workshops provide participants with ideas and tools to design assessments that effectively evaluate students' mastery of defined learning objectives. The three-part workshop series, which may be taken in any order, addresses summative, formative and alternative assessment. Topics include principles of question development, Bloom's taxonomy, inclusive pedagogy and backward design. We offer these workshops in a mix of virtual and in-person formats.

We are working to expand our network into communities that are historically underrepresented in BMB education leadership. Including participants from minority-serving institutions is not enough. The ICABL workshops are an opportunity to bring diverse perspectives into leadership positions. Engaged workshop participants are recruited into mentored leadership positions within the network. In this way, we

In follow-up surveys, 92% of respondents said the workshops increased their confidence in writing high-quality assessment items. And all respondents said the workshop promoted an inclusive environment where everyone was encouraged to participate.

ATTEND A 2023 WORKSHOP

This year, ICABL will host three workshops for BMB educators interested in developing their use of assessment to support deep and inclusive learning:

- **Feb. 11–12.** Thinking beyond exams: Creative ways to gauge student learning, at North Carolina Central University, Durham, North Carolina.
- **March 24.** How did I do? Using summative assessment to inform teaching efficacy, in conjunction with Discover BMB 2023, Seattle University, Seattle, Washington.
- **Summer 2023.** Building student success through formative assessment, location to be determined.

Accommodations, meals during the workshop and travel expenses (up to $400) are provided. Participants who attend an entire workshop and complete accompanying assignments will receive a $200 stipend.

For more information and to apply for a workshop, email us at info@icabl.org.

hope to transform leadership in the BMB education community to reflect the identities of all students in our classrooms.

Since the summer 2020 pilot, ICABL has hosted three workshops with 62 total participants. Of these, nearly 60% teach at Hispanic-serving institutions or HBCUs. Several participants already have moved into leadership roles. Jennifer Bobenko, who teaches at the University of Maryland Eastern Shore, an HBCU, describes her experience:

"Beyond the significant and immediate impact the workshop had on my teaching practice, the ICABL team continues to provide networking and professional development opportunities to me. The opportunity to co-host an assessment workshop with the ICABL team, serve on the ICABL Steering Committee and become a member of the ASBMB Certification Examination question writer/grader community have truly been rewarding."

BMB education is a global endeavor; therefore, assessment conversations also must include international partners. For our next step forward, in collaboration with the International Union of Biochemistry and Molecular Biology, ICABL will offer virtual workshops to help build a global BMB education community focused on assessment. We look forward to the first international ICABL workshop, to be held in 2024 following the IUBMB Congress in Melbourne, Australia.

We invite all BMB educators to apply to attend one of our workshops. We especially encourage applications from colleagues working at minority-serving institutions and those who embody diverse identities that historically have been underrepresented in STEM. By contributing your voice, you will help grow and enrich the BMB education community so that it reflects the variety of institutions and individuals in BMB programs and classrooms.

Kim Cortes, who works as co-PI on the ICABL grant, contributed to this article.

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Discover BMB | 2023

American Society for Biochemistry and Molecular Biology

MARCH 25-28 | SEATTLE

Registration deadline: March 23 | Hotel deadline: Feb. 14

WORKSHOPS

- Open-source tools to explore protein–ligand interaction in the undergraduate classroom
- Enzyme Function Initiative
- Escaping traditional pedagogy
- Basics of the iCn3D program
- Outreach for all ages
- Building partnerships to bridge STEM outreach to the real world
- Developing scientific writing courses for STEM training
- Building science communication training into your classrooms, programs and grants
- Success in scientific publishing
- National Science Foundation funding opportunities
- Incorporating anti-racism, social justice and equity themes into biochemistry courses
- Anti-racist classroom practices
- CV workshop
- Building professional relationships
- How to engage in advocacy
- Advocacy town hall
- Lab management

SYMPOSIA

- Advances in organismal and cellular metabolism
- AI and ML in structural biology, drug design and systems biology
- Bias in, bias out in data science
- Biochemistry of elemental cycling
- Cell signaling — new tools and emerging concepts
- Education and professional development
- Frontiers in carbohydrate synthesis and recognition
- Lipid dynamics and signals in membrane and protein structure
- Organelles, mechanisms and phase properties of cellular quality contro
- Protein machines and disorder
- Regulation of RNA

INTEREST GROUPS

- Bile acids: Fantastic beasts or fantastic molecules?
- Biochemistry and climate change
- Building research and mentoring networks for women at predominantly undergraduate institutions
- Emerging topics and techniques: focus on protein acetylation and oxidation
- Empowering trainees: A roundtable with the IUBMB Trainee Initiative
- Engineering enzymes and microorganisms to replace petroleum products with renewable biofuels and biomaterials
- Molecular engineering
- Teaching Gen Z: Challenges and opportunities

SPECIAL EVENTS

MARCH 25

- Undergraduate Poster Competition
- Undergraduate speed networking
- Business meeting
- Welcome reception

MARCH 26

- Women scientists networking event
- Grad/postdoc travel awardee networking event

MARCH 27

- Yoga
- Wellness walk

MARCH 28

- Flash talk competition
- Community science day (for high school students)
- Networking reception at the Seattle Aquarium