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ASBMB TODAY

THE MEMBER MAGAZINE OF THE AMERICAN SOCIETY FOR BIOCHEMISTRY AND MOLECULAR BIOLOGY

Happy holidays

(GIFT GUIDE INSIDE)

I AM A

COLLABORATOR

And I advance my research when I exchange ideas with scientists in related fields.

The 2018 ASBMB Annual Meeting provides countless occasions to step outside your niche and collaborate with scientists with different strengths. Thanks to the ASBMB's affiliation with the Experimental Biology conference, you'll have the opportunity for interdisciplinary learning and exchange. The event represents five host societies, multiple guest societies and attracts more than 12,000 scientists and exhibitors from throughout the biology research sphere.

KEY DEADLINES
LATE-BREAKING ABSTRACTS –FEB. 7
REGISTRATION DEADLINE –FEB. 27

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SAN DIEGO | APRIL 21–25

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CONTENTS

NEWS


11


15

FEATURES

22


28

PERSPECTIVES


36

42

ASBMB TODAY
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Lights in the darkness

By Comfort Dorn

Years ago, I read somewhere that people who live in Alaska sleep as much as 14 hours a night in winter. That makes perfect sense to me. It's cold up there near the Arctic Circle. And dark. Clearly, the best place to be is snuggled under the covers. I'll take my 14 hours with a side order of purring cat, thank you very much.

And it's not just me or those snoring Alaskans. Most life-forms appear to be biochemically wired to slow down when it's dark — mimosa plants, fruit flies, mice. For figuring out some of the science behind that seemingly obvious fact more than 30 years ago, three scientists in the U.S. won the 2017 Nobel Prize in medicine or physiology. To mark this honor, science writer John Arnst takes a dive into circadian rhythms on page 28 in this issue. As the December darkness falls, this seems like a suitably fascinating topic to curl up with.

But we humans don't go gently into any good night. In this season of slumber, we like to celebrate with light and warmth. It's no accident that December is crammed full of big, bright holidays. The celebration of the birth of Jesus and its very important star in the east got conveniently scheduled right around the Romans' big solstice party, conflating Jesus' arrival as the son/sun with the time when dark winter days started to get longer. Hanukkah grew from a lamp-lighting commemoration of the rededication of an ancient temple into a big gift-giving affair largely, some say, due to its proximity to Christmas. And the harvest festival of Kwanzaa, falling the week after Christmas, is marked with, among other things, a candelabra with seven flames. Then come the fireworks of New Year's Eve. So much light in the December darkness.

COURTESY OF EMILY HUFF/ASBMB

If you celebrate any or all of the aforementioned holidays, you should take a look at our gift guide on pages 22–23 and find something fun to give the scientists in your life (or yourself). And if you like to decorate for the holidays with scientific flair — as designer Valery Masterson did for our elegant cover photo by Emily Huff — we'd love to see your creations for the table, door, hearth or tree. Please snap a photo and share it with us on Facebook or Twitter.

Have a bright and festive December. If you're in Alaska, sweet dreams.

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

Looking back on a year of awakening

By Benjamin Corb

As 2017 winds to an end, we're taking stock of what the year has delivered for the biomedical research community. We have had reasons to be frustrated, reasons to celebrate and reasons to scratch our heads. Let's look back.

The year started with the inauguration of President Donald Trump, which began an era of open skepticism of science in the executive branch of government. Trump proposed massive cuts in investments to biomedical research and put forth immigration policy changes that have caused concerns within the science community. Gag orders, executive orders and conflicting policy positions have been the norm in the first year of the Trump administration.

On the bright side, the president convened a summit of biomedical and pharmaceutical leaders to talk about research (although the discussion largely focused on pharmaceutical drug prices) and kept Francis S. Collins on in his role as director of the National Institutes of Health.

Congress, for its part, largely has continued its support of the science community, following the successes of 2016, when Congress passed the 21st Century Cures Act and increased investments in the life sciences, with the NIH receiving a $2 billion increase for fiscal 2017. While the past year has been defined by legislative gridlock, Congress does appear ready to continue the upward trend of investing in biomedical research at the NIH, having proposed increases for fiscal 2018. We are waiting for approval of the final spending plan.

All is not positive in Congress, however. We continue to monitor activity on a tax reform effort that would affect our community by taxing tuition waivers, which could increase graduate students' tax burdens.

Perhaps most importantly, we have seen an apparent awakening of scientific community in terms of the importance of advocacy and getting involved. After the election of Trump, we saw the organic growth of the March for Science effort. (The American Society for Biochemistry and Molecular Biology was a sponsor of the national march, and society members participated in the Chicago march during the 2017 Experimental Biology meeting.) The network of marches included hundreds of thousands of scientists taking to the streets to support the nation's scientific enterprise, and the events offered many ASBMB members to their first advocacy experiences.

Here at the ASBMB, we look forward to building on the lessons learned in 2017 — namely, the need to be active and engaged. Given our rapid responses to administration policies that affected science and scientists, our vocal support for positive legislative initiatives, and our coordination and engagement with an excited and interested scientific community, we believe we'll look back at 2017 as a year of awakening for the science advocacy community.

Check this space next month, when we'll explore how the ASBMB plans to continue our engagement in the year to come.

Benjamin Corb (bcorb@asbmb.org) is director of public affairs at the ASBMB. Follow him on Twitter @bwcorb.

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Member update

By Erik Chaulk

Philipp elected Fulbright president


PHILIPP

Manfred Philipp, professor emeritus at Lehman College and the City University of New York Graduate Center, has been elected as the 2018 president of the Fulbright Association.

Established in 1977, the Fulbright Association is a nonprofit alumni organization of the Fulbright Program dedicated to promoting scholarship and cultural exchange.

Philipp served as a Fulbright scholar in 2005 at the Catholic University of Portugal, where he taught bioinformatics and biopharmaceutics. He also served as a Fulbright scholar in 2012 and 2013, during which time he did research on multidrug-resistant bacteria at the Patan Academy of Health Sciences, Kathmandu, Nepal.

At the Fulbright Association, Philipp is also chair of the national conference committee and has served as secretary of the board of directors.

Philipp will assume his new role in January.

Schramm joins AzurRx board


SCHRAMM

Vern Lee Schramm, professor of biochemistry at the Albert Einstein College of Medicine, was appointed to the board of directors at AzurRx BioPharma Inc. in October.

AzurRx is a biopharmaceutical company that specializes in developing recombinant protein therapies for gastrointestinal diseases and microbiome-related conditions.

Schramm has been on the faculty at the Albert Einstein College of Medicine since 1987, serving as chair of the department of chemistry from 1987 to 2015. He currently holds the Ruth Merns chair in biochemistry.

His research interests include enzymatic transition state analysis, transition state inhibitor design, biological targets for inhibitor design and mechanisms of N-ribosyltransferases.

In memoriam: Harvey Penefsky

Influential bioenergetics and enzyme kinetics researcher Harvey S. Penefsky passed away in July at the age of 92.

Originally from Chicago, Penefsky attended New York University after serving in the Army. He completed his undergraduate studies in 1956 and earned his Ph.D. in 1960.

His thesis work with Efraim Racker and Maynard Pullman led to the biochemical and kinetic characterization of ATP synthase and the introduction of enzyme reconstitution studies in Racker's lab.

In the early 1960s, Penefsky joined the Public Health Research Institute at Rutgers University as a staff researcher. He remained a part of the faculty at PHRI for more than 40 years, during which time he was considered a pioneer in the field of bioenergetics.

In the 1980s, Penefsky's kinetic insights shaped the understanding of the mechanism of ATP synthase. This research, conducted alongside Richard Cross and Charlie Grubmeyer, provided the groundwork for Paul D. Boyer, who won the 1997 Nobel Prize in chemistry for elucidating the enzymatic mechanism of the ATP synthase.

Penefsky also served on the faculty at the State University of New York, Syracuse, from 1988 to 1996 and as a member of the department of microbiology and molecular genetics at the New Jersey Medical School from 2002 to 2007.

Zia Penefsky, Harvey's wife of 61 years, died in 2015.

Maquat elected to National Academy of Medicine


MAQUAT

Lynne Elizabeth Maquat is one of 80 new members elected to the National Academy of Medicine.

Maquat is the J. Lowell Orbison endowed chair and a professor in the department of biochemistry and biophysics at the University of Rochester Medical Center.

Members are elected to the National Academy of Medicine based on professional achievement related to health and medicine, as well as commitment to service.

Maquat's research focuses on RNA decay pathways in relation to human diseases. She is also director of the Center for RNA Biology: From Genome to Therapeutics at Rochester, where she conducts and supports interdisciplinary RNA research.

Bryant receives ASM's White award

BRYANT

Donald A. Bryant has won the American Society for Microbiology's 2018 D.C. White Research and Mentoring Award.

This award recognizes outstanding achievement in interdisciplinary research and mentoring in the field of microbiology.

Bryant came to Penn State in 1981 and has served as the Ernest C. Pollard professor of biotechnology since 1992. He is also a professor of biochemistry and molecular biology.

His research explores the genomics, metabolism, physiology and structure of chlorophototrophic bacteria.

In memoriam: Eric Conn

CONN

Eric E. Conn, professor emeritus at the University of California, Davis, passed away in September. He was 94.

Conn received his undergraduate degree in chemistry from the University of Colorado at Boulder in 1944. He then worked as an inorganic chemist with the Manhattan Project during World War II.

He earned his Ph.D. in biochemistry in 1948 and completed postdoctoral training, both at the University of Chicago. In 1950, Conn joined the faculty at UC Berkeley, where he spent eight years before going to UC Davis.

Conn co-founded the department of biochemistry and biophysics at UC Davis, which was later reorganized and integrated into the department of molecular and cellular biology.

Conn developed the university's introductory biochemistry course in 1959 and taught it until his retirement in 1993. He also co-authored "Outlines of Biochemistry" in 1963. The textbook was the first of its kind to explore the principles of metabolism in a nonencyclopedic way.

Among his many honors, Conn received the UC Davis Academic Senate Distinguished Teaching Award in 1974 and the Academic Senate Faculty Research Lecturer Award in 1977. He was elected to the National Academy of Sciences in 1988.

He remained a part of the UC Davis community after his retirement as professor emeritus in the department of molecular and cellular biology.

Ackerman honored as student athlete

East Stroudsburg University senior offensive lineman Devon Ackerman

ACKERMAN

was a semifinalist for the National Football Foundation's 2017 William V. Campbell Trophy.

Ackerman was one of 181 athletes nominated as semifinalists for the award. The National Football Foundation narrows this pool to between 12 and 14 finalists, with each receiving an $18,000 postgraduate scholarship and recognition as a part of the NFF National Scholar-Athlete Class.

Individuals are chosen based on athletic and academic accomplishments as well as community service. Ackerman is a two-time Academic All-America first team selection, was twice named to the Pennsylvania State Athletic Conference Fall Top 10 and started all 44 games of his career at ESU.

He is a biochemistry and chemical biotechnology major and has maintained a 4.0 GPA throughout his collegiate tenure. He plans to attend medical school after graduation this month.

Ackerman assisted with the ESU's partnership with the Special Olympics and the Salvation Army, among other community service projects.

Erik Chaulk (echaulk@asbmb.org) is a peer-review coordinator and digital publications web specialist at the ASBMB.

Send us your news

Have you recently been promoted or honored? Do you have good news to share with your fellow ASBMB members?

Email it to us at asbmbtoday@asbmb.org — and don't forget to include a photo!

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ASBMB
American Society for Biochemistry and Molecular Biology

Tabor winner explores protein kinases and disease

By Adriana Bankston

Alterations in protein kinases are frequently observed in cancer and other diseases. But the molecular functions of many protein kinases are unknown. This is the challenge that Vincent Tagliabracci, assistant professor at the University of Texas Southwestern Medical Center, is tackling is his laboratory work. He hopes to combine bioinformatics, biochemistry and structural biology to uncover atypical and uncharacterized protein kinases and to understand how they might provide insights into particular diseases. For this work, he has won a 2017 Journal of Biological Chemistry/Herb Tabor Young Investigator Award.

JBC Associate Editor Alex Toker of Harvard University presented the award at the Federation of American Societies for Experimental Biology conference on protein kinases and protein phosphorylation held Aug. 6–11 at Robinson College in Cambridge, U.K. According to Toker, "Vincent's work represents an exciting new area of research in atypical protein kinases with direct relevance to human biology and pathophysiology, opening new avenues for drug discovery and potential treatment."

Tagliabracci's recent work focuses on how uncharacterized kinases can help us understand the molecular basis of human disease. Most research in this area has focused on a few protein kinases with alterations frequently observed in cancer, metabolic dysfunction and neurodegeneration. However, a large number of protein kinases are poorly characterized at the molecular level. "We try to stay away from mainstream protein kinase research," Tagliabracci said. "We are discovering quite a bit of exciting and unexplored biology associated with these atypical protein kinase families." In a recent publication, Tagliabracci and his colleagues defined a family of atypical protein kinases that had an unexpected role in phosphorylation of proteins important in spore biology.

COURTESY OF VINCENT TAGLIABRACCI

Vincent Tagliabracci won a 2017 Tabor award for his work on protein kinases associated with Raine syndrome and hypophosphatemia, conditions characterized by abnormal biomineralization in babies and children.

In his laboratory at UT Southwestern, Tagliabracci's work examines a family of secretory pathway kinases associated with Raine syndrome and hypophosphatemia. Raine syndrome is a neonatal osteosclerotic bone dysplasia characterized by craniofacial abnormalities and death usually in the first week of life. Hypophosphatemia is characterized by an abnormally low level of phosphate in the blood, which can lead to muscle weakness, respiratory failure and heart failure. "What started as just a scientific curiosity (i.e., how are secreted proteins phosphorylated) has ultimately provided a molecular explanation for the abnormal biomineralization in kids with Raine syndrome and hypophosphatemic rickets," Tagliabracci said.

Born in Sault Ste. Marie, Ontario, Tagliabracci attended the University of Indianapolis, graduating in 2005 with a bachelor's degree in chemistry and biology. His interest in glycogen metabolism took him to Peter Roach's laboratory at Indiana University School of Medicine for his Ph.D. After completing his Ph.D. in 2010, Tagliabracci pursued his postdoctoral work in the laboratory of Jack Dixon at the University of California, San Diego. He became an assistant professor at UT Southwestern in 2015 and was appointed the Michael L. Rosenberg scholar in medical research. This UT Southwestern program recruits junior faculty to explore curiosity-driven science and provides them with the funding to do so. "UT Southwestern has given me the freedom to take risks," Tagliabracci said, "which has allowed me to do this type of research that I hope will lead to more unexpected discoveries."

Adriana Bankston (abankston81@gmail.com) is a former bench scientist with a passion for improving training and policies for junior scientists. She is also a member of the board of directors at the nonprofit organization Future of Research.

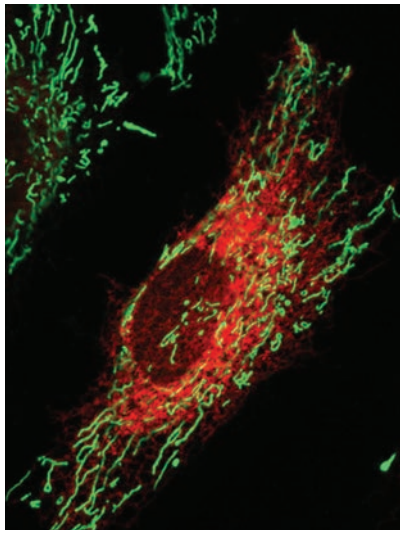
What makes organelles connect?

By Sasha Mushegian

Inside every cell is a complex infrastructure of organelles carrying out different functions. Organelles must exchange signals and materials to make the cell operate correctly. Researchers are using new technologies to see and understand the networks that connect these organelles, allowing them to build maps of the trade routes that exist within a cell. A recent article in the **Journal of Biological Chemistry** reports the use of an emerging method to identify proteins that allows two organelles, the mitochondria and the endoplasmic reticulum, to attach to each other.

Jeffrey Golden, a professor at Brigham and Women's Hospital and Harvard Medical School, oversaw the work. "Think of (an organelle) like a ferry docking at one site, unloading and loading passengers and cars, and then going to another site and doing the same thing," Golden said. "Their ability to dock, load and unload cargo requires guides or ramps of specific widths and heights that connect the boat and land, or they cannot freely load and unload."

Contact points between the endoplasmic reticulum, or ER, and mitochondria are the "ramps" and "guides" that enable these contacts. They permit important activities like signaling, exchange of calcium and lipids, and control of mitochondrial physiology. Faulty connections between the ER and mitochondria have been implicated in several neurodegenerative diseases, including Alzheimer's, Parkinson's and Huntington's disease. The proteins that connect and bridge the ER and mitochondria are well-studied in yeast, but the connections between these organelles in multicellular organisms like mammals are more complex and less understood.



COURTESY OF GINAM CHO

Live-imaged HeLa cells with the endoplasmic reticulum labeled red and mitochondria labeled green.

Golden's collaborator Ginam Cho and research fellow Il-Taeg Cho had the idea to search for proteins important for ER–mitochondrial contact using a method recently developed to show contact between proteins. The method takes advantage of an enzyme called ascorbate peroxidase, or APEX, which can attach biotin to proteins nearby. The team engineered cells to produce mitochondria that had APEX attached to their outer membranes and then added biotin to the cells for the APEX to use to label nearby proteins.

The team then isolated parts of the cell that contained the ER, purified those proteins that had biotin attached and identified the ones found in the ER using mass spectrometry. Because the APEX was attached to mitochondria, only those proteins that came into close proximity to the mitochondria could have had biotin attached. Thus, the biotin served as a kind of passport stamp that indicated which proteins had been involved in the ER-mitochondria contact.

"It was previously feasible to only look at one molecule at a time to assess what it interacted with," Golden said. "The method we have used is more rapid and allows an unbiased look at a whole system and what's happening at that organelle's interface."

Using this screening method, the researchers zeroed in on an ER protein called RTN1a, which previously was known to contribute to the ER's shape. In follow-up experiments, they confirmed that this protein also helped mitochondria to attach to the ER.

This study raises the possibility that defects in RTN1a could contribute to the problems experienced by patients with neurodegenerative diseases, but the researchers won't know for sure until they conduct additional experiments, including similar studies in neural cells.

Golden speculates that the proteins important for ER–mitochondrial contact might be different in different cell types.

"Does the liver use the same proteins to control these kinds of interactions that neural cells do? Is one (protein) more important for calcium exchange and another set of proteins more important for lipid exchange?" Golden asked. "I think there's a lot of cell biology that we just don't know and could be answered." The team now is using the APEX-mass spectrometry method to compare proteins involved in ER–mitochondrial contacts between normal and patient-derived neural cells.

"There are a lot of interesting things we can do," Il-Taeg Cho said.

Sasha Mushegian (amushegian@asbmb.org) is scientific communicator for the Journal of Biological Chemistry.

Mining for new enzymes to create bioplastics

By Robert E. Dempski

Plastics are a ubiquitous part of our daily lives. Most plastics that we use are the product of petroleum or natural gas. Not only are plastics made of petroleum or natural gas, but they also require additional fossil fuels to produce. Further, our infatuation with plastics is increasing; more plastic was produced globally in the past 13 years than in the previous 50.

Yasuo Ohnishi and colleagues from the University of Tokyo and Ishikawa Prefectural University aim to use bacteria to create starting materials for production of super-engineering plastics (those with better mechanical and thermal properties than more widely used commodity plastics), decreasing a reliance on fossil fuels. Toward this goal, in a recent paper in the **Journal of Biological Chemistry**, Ohnishi and colleagues write that they have identified a new enzyme that can add a nitro group to the benzene ring of tyrosine to produce 3-nitrotyrosine. A nitro group can easily be reduced to an amino group, which is a useful functional group for polymer production. This finding has the potential to be a new avenue toward using bacteria to create useful compounds in bioplastic development as well as helping to design metabolic pathways in the field of synthetic biology.

Benzene is a ring of six carbon atoms that can be used as a starting material to make materials such as polystyrene, nylon and adhesives. The Ohnishi lab was awarded a grant from the Japan Science and Technology Agency to create new compounds that can be used for bioplastics production or in the field of synthetic biology. As Ohnishi described it, "In the microbial production of useful compounds, the microbial cell is a 'factory' and enzymes are 'machines.' So, we needed a new machine to design a new 'assembly line' to produce aromatic compounds that can be used as a monomer of bioplastics; the new machine that we needed is an aromatic compound-nitrating enzyme."

COURTESY OF TATSUO KANEKO

This extreme heat-resistant polymer was synthesized by Tatsuo Kaneko of the Japan Advanced Institute of Science and Technology from an aromatic compound. The nitrating-P450 found by the Ohnishi group may be useful in the microbial production of a monomer for such a super-engineering plastic.

To find this machine, the Ohnishi group initiated a search of a chemical compound database to identify nitrated benzene compounds. This search identified rufomycin, a small circular molecule containing seven amino acids that was first identified as an anti-tuberculosis drug. Most relevant for the studies by the Ohnishi group, rufomycin contains a nitrated tyrosine residue. Thus, the Ohnishi group was able to identify the nitrating enzyme by isolating the genes that make rufomycin, which enabled the discovery of a new protein, RufO, a tyrosine 3-nitration enzyme.

The lab's excitement at finding the first enzyme to nitrate tyrosine residues is tempered slightly by the observation that the enzyme activity is not very high. To integrate RufO into a useful enzyme for bioplastic production, it needs to have higher activity. To this end, the Ohnishi lab hopes to use two approaches to improve tyrosine nitration. First, now that a protein has been identified that performs this function, searches of homologous genes may identify proteins with related functionality. Second, structural analysis and mutagenesis studies may provide a pathway to generate new proteins with enhanced functionality. If either of these approaches is successful, we will be one step closer to decreasing our reliance on petroleum and natural gas for making plastics.

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A focus on iron

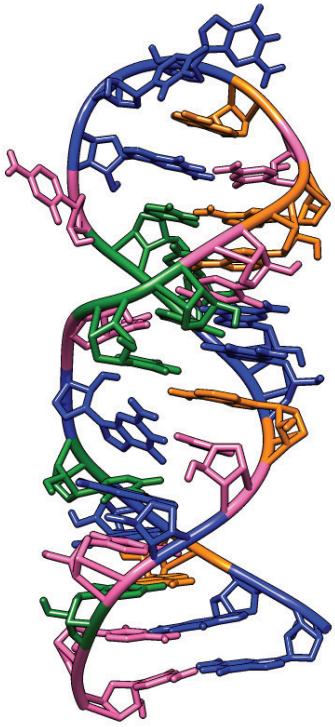
The 10th installment of a thematic series explores the king of metals in biology

By Nathalie Gerassimov

Proverbs like "an apple a day keeps the doctor away" remind us that certain foods promote good health. However, it may be less apparent that metals are an essential part of our diet. Miniscule amounts of numerous metals are present in an apple — iron, sodium, potassium, calcium and magnesium — all of which are necessary for life. "Metals in Biology," a thematic review series started in 2009 in the **Journal of Biological Chemistry**, takes a closer look at diverse metals and their roles.

The six minireviews in the 10th installment of the series provide new insights into why iron is "the king of metals in biology," according to F. Peter Guengerich of Vanderbilt University School of Medicine, the JBC deputy editor who coordinates the series. "Iron is relatively abundant in the human body and has a great variety of roles," Guengerich said, "including electron transfer, structural contributions and a role in iron-sulfur clusters (iron in complex with either a cysteine or sulfide linkage). Although magnesium and zinc are also abundant and important, as far as we know they do not undergo redox chemistry," which limits their versatility.

The first two reviews in the series, by Richard Coffey, Tomas Ganz and Mitchell D. Knutson, give an overview of how iron is acquired, used and stored in the body, including the cell types and molecular pathways involved. Mammals have adapted to holding onto their iron because no regulated excretion exists. However, too much iron is toxic, so it is regulated primarily at the level of nutritional iron absorption in our gut and the tightly controlled release of iron from its main storage in the liver into circulation in the body. Interestingly,



COURTESY OF NUNZIATA MAIO/JOURNAL OF BIOLOGICAL CHEMISTRY

This image shows the main components of the structure of the 30-nucleotide iron-responsive element located near the 5' end of the messenger RNA of ferritin.

the membrane transporter involved in iron uptake in the gut, called divalent metal-ion transporter 1, or DMT1, was also the first mammalian transmembrane iron transporter to be discovered 20 years ago, igniting the iron biology field. Taken together, these first two reviews introduce the reader to major insights into iron biology from the past two decades.

The third review, by Tracey Rouault and Nunziate Maio, takes a closer look at how iron levels are sensed and regulated in the body. Early insights in this area arose from studies of ferritin, a major iron-storage protein, which is translationally regulated by iron regulatory protein 1, or IRP1, and its iron–sulfur cluster switch. When cellular iron is low, IRP1 lacks the iron–sulfur cluster and binds ferritin's mRNA to decrease its translation and, ultimately, iron storage. This same IRP1 switch can increase the translation of other iron regulators that in turn increase iron absorption in the gut and import more iron into cells. Many other proteins besides IRP1 contain iron–sulfur clusters; the best known examples are mitochondrial proteins involved in oxidative phosphorylation, known as Complex I and II, where these clusters are used as electron carriers. However, questions remain pertaining to their synthesis in cells and their delivery to appropriate proteins. The third review discusses the progression of this field and concludes that "it is possible that hundreds of Fe-S proteins are present in mammalian cells, waiting to be identified." Therefore, many new insights in this field are to be expected. The fourth review, by Joseph Braymer and Roland Lill, goes into mechanistic aspects of iron–sulfur cluster syntheses in mitochondria to further elaborate this process.

Iron ions, either free or bound in heme groups or iron–sulfur clusters, must be transported in the cell by specialized proteins called chaperones. For example, the dietary iron that is taken up by the gut cells via the iron importer DMT1 must be transported by an iron chaperone from the importer to the exporter ferroportin before it can be shuttled by transferrin throughout the body. The fifth review, by Caroline Philpott and colleagues, offers insight into how iron transport in cells is mediated by iron metal chaperones.

The last review of this series, by Sharleen V. Menezes and colleagues,

CONTINUED ON PAGE 14

Seeking a key to anesthetic susceptibility

By Rachel Goldberg

With an estimated 234 million surgeries performed around the world each year, anesthesia is considered one of the most important medical discoveries in the past 200 years. Drugs in this broad group prevent a patient from being conscious and from feeling pain during surgery, yet we still don't fully understand how many anesthetics work. A recent paper in the **Journal of Lipid Research** sheds new light on the molecular mechanism underlying anesthesia and proposes a noninvasive technique to monitor its activity.

M. Francesca Cordeiro's research group at the University College London Institute of Ophthalmology began this research after a close relative of one of the authors experienced a complication from general anesthesia. For most people, general anesthetics work well and are exceptionally safe; however, up to 2 percent of the population is resistant to anesthesia. In extreme cases, patients that appear unconscious are awake and can sometimes feel pain, but they remain paralyzed. While awareness during general anesthesia is rare, it is distressing for the patient and can cause problems, including post-traumatic stress disorder, well after surgery.

Most drug molecules affect the body through binding specific protein receptors, "like a key fitting a lock," Cordeiro and first author Benjamin Michael Davis wrote in response to questions about the study. However, researchers have been unable to identify the receptors that many anesthetic molecules bind to. Researchers "have a bunch of keys but don't know what locks they fit into," Cordeiro and Davis wrote. "This is a problem because the way we typically design better drug molecules is by studying the receptors they interact with, and without knowing the receptors, we don't know which key fits which lock and how this interaction could be made better." Researchers have debated over the past 100 years whether anesthetics "interact directly with a receptor, like a key in lock, or instead act at a distance, without directly interacting with a receptor, like a wireless car key fob," they wrote.

Previous research indicates that anesthetics might interact with the cell membrane where protein receptors are housed and, by changing some unknown membrane property, indirectly alter receptor activity to induce unconsciousness and pain insensitivity. As cell membranes are composed of fat, some scientists have suggested that changes in membrane fluidity could be responsible for the indirect method of anesthesia activity. However, this seems unlikely, as normal changes in body temperature can cause bigger alterations in membrane fluidity than anesthetics can; we don't usually lose consciousness after a day in the sun or after exercise (when our internal body temperature increases).In the recent study, Davis and colleagues proposed that anesthetics indirectly affect receptors by changing membrane dipole potential and not cell-membrane fluidity. The membrane dipole potential is an electrical potential that arises from the arrangement of fat (phospholipids and sterols) and water molecules in the cell membrane. Davis and colleagues discovered that some anesthetic molecules could change the membrane dipole potential. They suggest that this could act like a car fob signal, causing an indirect change in receptor function and thereby opening the lock.

The researchers believe their findings will help identify which receptor proteins are involved in anesthetic activity, thereby facilitating the design of more potent anesthetics with fewer side effects. Additionally, membrane dipole potential can be measured in real time using a small fluorescent dye molecule called di-8-ANEPPs. This has been done only in artificial membranes, building on Cordeiro's extensive experience with developing retinal-based contrast agents for the early diagnosis of neurodegenerative disease in the clinic (1). However, Davis and colleagues believe this dye could be used in conjunction with an established retinal imaging technique called confocal scanning laser ophthalmoscopy to develop a simple and noninvasive test to evaluate a patient's susceptibility to anesthesia. This noninvasive test has the potential to minimize the risk of anesthetic awareness in patients and provide a much-needed tool to quickly and reli-

CONTINUED ON PAGE 14

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looks at the importance of iron in cancer metastasis. Specifically, it focuses on the regulation of Nmyc downstream-regulated gene 1, or NDRG1, which is a well-known metastasis suppressor associated with favorable prognosis in several cancer types. However, "the roles of iron in cancer are complex," Guengerich said. "Also, dysregulation of iron metabolism can increase tumor growth, and cancer cells can exhibit an enhanced dependence on iron, a phenomenon termed 'iron addiction.'" This review is only a small part of the picture, and controversies exist in this area.

Iron has been featured in most installments of "Metals in Biology." This is the second time it is the sole focus. Other metals will be included in the future. "I do not think we will cover every metal in the periodic chart, in that some are not very relevant in biology," Guengerich said. "We will try to highlight work with the most relevant metals but also provide some insight to some which have less frequent occurrences in biology, as we have in the past (e.g., nickel and vanadium)."

The next installment will focus on copper. "Copper has many of the same properties of its transition metal colleague iron," Guengerich said, "but it is not as ubiquitous in terms of roles and the number of enzymes. As in the case of iron, free copper is deleterious, and the homeostasis is tightly controlled by a number of biological mechanisms."

And while that daily apple has some health benefits, the iron in apples is not the most bio-available form for humans. If your body needs more iron, animal products (such as red meats, fish and poultry) are a better source of so-called heme-bound iron, which can be absorbed by your body much more efficiently.

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ably assess anesthetic activity.

Much of this work was done using artificial membrane systems, so the next step is to use rodent models to investigate whether changes in the dipole potential can be detected in the retina of rodents upon anesthesia induction. After testing in a preclinical setting, the researchers hope to conduct a clinical trial, Cordeiro and Davis wrote, adding that the potential to monitor anesthetic activity with noninvasive retinal imaging is exciting, "as it has the potential to identify patients at risk of anesthetic awareness before undergoing surgery."

Rachel Goldberg (goldberg.rachelr@gmail.com) is a molecular biologist and postdoctoral research fellow at the Johns Hopkins University School of Medicine.

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Upcoming ASBMB events and deadlines

DEC
5: 2019 Special Symposium proposals due
7: Abstract submission deadline for the 2018 ASBMB Annual Meeting, San Diego
14: Travel award deadline for the 2018 ASBMB Annual Meeting, San Diego

JAN
2: Art of Science Communication course open for applications

FEB
5: Art of Science Communication begins
7: Late breaking abstract submission deadline
27: Early registration deadline for the 2018 ASBMB Annual Meeting, San Diego

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How exercise works its biomolecular wonders

By John Arnst

Exercise has long been known to benefit the entire body, from burning fat and strengthening muscles to boosting the immune system and reducing the risk of some cancers. To understand how some of these effects are controlled on a cellular level, researchers at the University of Sydney did a proteomic analysis of the swarm of peptide and small-protein hormones that circulate throughout the body in blood plasma.

Benjamin Parker, the first author on the paper published in **Molecular & Cellular Proteomics**, said, "There's a big push in the field to identify secreted factors that allow organs to communicate with each other, and this might enable them to adapt to certain environmental stresses … like exercise." The researchers ultimately hope that their novel combination of techniques for proteomic analysis might be used to pinpoint the factors behind certain health benefits for potential drug development.

Parker and colleagues used a combination of tagging and fragmentation techniques, multidimensional liquid chromatography and tandem mass spectrometry to identify 5,548 peptides in the peptidome, the aggregate of peptide molecules that circulate in the plasma with blood cells. They found that the levels of the circulating small molecules were modulated rapidly during and after exercise through a network of post-translational modifications and proteases.

"We know that when we exercise, there will be certain factors and hormones that get released into our body, into our bloodstream, that then enable different tissues to adapt to that increased workload," Parker said. While the researchers noted expected elevated levels of hormones, including insulin and the vasodilator bradykinin, they also found that antimicrobial and immune-related peptides were upregulated.

"We don't know exactly why the body is doing that, but you could maybe (make the) link that exercise is improving our immune system," Parker said.

Parker and colleagues analyzed blood samples collected before, during and after exercise from volunteers at a facility at the University of Copenhagen operated by co-authors Erik Richter, Bente Kiens and Jørgen Wojtaszewski, who have been exploring the effects of exercise on various signaling molecules for more than two decades.

The researchers also noted the presence of new, uncharacterized peptides that were found to affect cells' ability to grow and proliferate, which may play a role in the noted anticancer effects of exercise, Parker said.

Examining the levels of certain peptides in blood plasma also allowed the researchers to characterize the activity of the numerous proteases that cleaved the peptides into their smaller, functional selves. By monitoring these protease levels, Parker and his colleagues were able to infer whether exercise is responsible for an increase or a decrease in specific proteases, some of which have been associated with an increased risk of heart attacks during strenuous exercise for people with higher rates of arterial plaques.

"There's sort of a controversy in the field about how good it is to activate certain proteases with exercise," Parker said. "It could be related to how we activate proteases that cause plaques to rupture in our hearts, in our coronary circulation." In that case, he said, strenuous exercise "may not be always a beneficial thing."

Parker and colleagues are continuing their proteomic analyses by examining the functional surfaces of exosomes, which are small membrane-bound vesicles used to send proteins, DNA and RNA between distant cells and organs, and they hope to publish their follow-up results soon.

John Arnst (jarnst@asbmb.org) is ASBMB Today's science writer. Follow him on Twitter @arnstjohn.

Toward 'harmonizing' lipidomics

By Angela Hopp

Scientists have been studying lipids and their effects on the human body for many decades. As new technologies emerge and yield great volumes of data, those who work in the emerging field of lipidomics are under increasing pressure to ensure reproducibility and greater transparency. A new paper in the **Journal of Lipid Research** represents another step toward those goals, reporting the results of a lipidomics comparison study performed by 31 labs in the U.S. and abroad.

BOWDEN

The project, led by John Bowden of the National Institute of Standards and Technology, required all participating laboratories to use their own methods and conventions to measure lipids in NIST's Standard Reference Material 1950. The team picked SRM 1950 ("Metabolites in Frozen Human Plasma") because it is commercially available and was made from plasma of 100 individuals who are representative of the U.S. population.

In the end, the cohort reported more than 1,500 unique lipids (arranged by sum composition), and NIST's stats team determined consensus location estimates and uncertainties (probable concentration and range) for 339 lipids that were reported by at least five laboratories.

ASBMB Today's executive editor, Angela Hopp, talked to Bowden about what spurred him to do the interlaboratory comparison exercise and how it may influence lipidomics as the field continues to mature. The interview has been edited for length and clarity. Read the full interview online.

COURTESY OF NIST

Participants in the study used their own methods and conventions to measure lipids in this reference material, SRM 1950.

What motivated you to undertake this study?

Everybody is employing different work flows, and the technology to measure lipids is rapidly advancing. This is combined with the fact that more and more people are getting into the field and the fact that maybe those people who get into the field don't know the impact of measurement decisions or don't have any experience with how to actually process data.

NIST is interested in making an impact on the measurement science of lipids. But we first need to establish a baseline for how lipids are currently measured across the community. We (asked): "How much variation exists in the community right now with all the different methodologies and philosophies noted for measuring lipids?"

We gave all the laboratories the SRMs, frozen and homogenous materials, and we said: "Measure the lipids quantitatively using your routine lipidomic methodologies. Measure what you're comfortable measuring. Provide us the data. And then, using that data, we can assess the weaknesses and strengths in how things are measured and what is the extent of the variation that exists within the community.

We can now begin to figure out how to continue improving measurement practices and get to the next step, which is communitywide harmonization. From there, we can then begin discussing efforts toward standardization.

How can people use the information your project generated?

The NIST Statistical Engineering Department generated several consensus mean estimates with uncertainties for lipid data submitted by all laboratories. Consensus means estimates signify the probable concentration and range, using the uncertainty, for a lipid measured in the SRM.

If you want to extend quality-control activities from the intralaboratory level to interlaboratory level, there are not many tools to do this type of activity. So, by providing these consensus means for specific SRMs, labs can now buy that material and they can assess how they're doing in

comparison to a good cross-section of the community.

You know, the kind of stuff we're doing is not sexy but it is important. It can be hard sometimes to get people excited about the measurement science of lipids.

If lipidomics is going to continue to expand and mature, in the clinical field or any field, there have to be best-practice guidelines. There have to be metrics to assess data quality. Of course, those things don't come overnight. You have to get the community interested in efforts aimed at improving harmonization, and I think we have.

You sense that this is becoming more valued by the community.

We had about a 30 percent participation rate for this study. (Author's note: Bowden invited 100 labs to participate.) Well, one of the questions on our follow-up survey was "Have you participated in an intercomparison study?" And a bunch of people said they had, (but) not a lot. And there was another question: "Would you like to participate in a (future) interlab study?" And we had, I think, over 100 people say "yes." I think that that is because, over the last three years, I've been presenting at conferences. I've been networking. We've been spreading the message of metrology.

I think when this work gets published and people start embracing harmonization, you're eventually going to start seeing journals requiring authors to provide more details about their lipidomics data before they publish articles. With metabolomics right now, there are certain guidelines — certain things you have to address or you have to mention in your paper. You know, if you go to get grants, hopefully there's going to be a way for people to assess whether you are a laboratory that provides quality measurements or not.

"You know, the kind of stuff we're doing is not sexy but it is important. It can be hard sometimes to get people excited about the measurement science of lipids."

There are very few ways to assess the quality of someone's lipidomics data. In my survey, I think over 90 percent of the people don't put their data in repositories. This needs to change; we need to promote more transparency with the data we collect and publish.

In the paper, you mentioned that this is all a bit polarizing. How so?

So, it's polarizing on multiple levels. If you talk about how things are measured, in terms of methodology, there are different camps. For example, targeted versus untargeted lipidomics.

It's also polarizing when you get into the finer details of measurement. So, for instance, if you're talking about quantitation. There's a lot of different philosophies on how you're supposed to quantitate, even down to the point of how you define your quantitation — like whether it's absolute, relative, semi, etc. How you define lipid quantitation, just the definition of that — people have different philosophies.

For example, in most fields quantitation requires a standard measured at multiple concentrations, which almost exactly matches your compounds of interest. In untargeted lipidomics, a standard with slightly different properties at only one concentration may be used. Some people still refer to this method as quantitation; some say relative quantitation; some say semiquantitation. But we don't have a consensus on what words to use. These words are important; they let you know whether the concentration reported is a rough estimate or can be considered accurate within a defined level of uncertainty.

As you dig deeper into the fundamentals of how lipids are measured, more and more things come to light, and everybody in the community is going to have their own philosophy on how to address each aspect of measurement.

We have some follow-up manuscripts (coming), and one of them is actually taking method information, whether it be their extraction method or how they're processing data or their mass spec approach, and looking at how different methodology drives certain trends in the submitted data.

Have you had any pushback?

I think most researchers recognize the need for better measurement efforts and best-practice guidelines. Even those who did not participate in the exercise, many of them indicated that they supported the efforts. I think the resistance, if any, will come when best-practice guidelines are introduced, as I'm sure people will have differing opinions on what the guidelines should entail.

I think, ultimately, that the community will have to realize that we all need to work together.

I'm not waiting for it to happen. I'll keep pushing.

Angela Hopp (ahopp@asbmb.org) is executive editor of ASBMB Today and communications director at the ASBMB.

From the journals

By Sasha Mushegin, Angela Hopp and Saddiq Zahari

We offer a selection of recent papers on a variety of topics from the **Journal of Biological Chemistry**, the **Journal of Lipid Research**, and **Molecular & Cellular Proteomics**.

This is your brain's beta-synuclein on acid

The main component of pathological protein fibrils in Parkinson's disease is alpha-synuclein. A closely related protein, beta-synuclein, typically does not form fibrils in the cytoplasm but appears to be involved in lysosomal dysfunction in some forms of dementia. In a paper in the **Journal of Biological Chemistry**, Gina Moriarty and colleagues at Rutgers University show that beta-synuclein forms fibrils at mildly acidic pH, suggesting that pH conditions in cellular microenvironments may contribute to beta-synuclein's role in neurodegenerative diseases.
doi: 10.1074/jbc.M117.780528

Biofilm disrupters in the human gut

The cholera-causing bacterium Vibrio cholerae occupies several niches, including living freely in water, colonizing crustaceans or invading the human intestine. Various environmental factors can induce or inhibit V. cholerae biofilm formation through a c-di-GMP signaling pathway. In a study in the **Journal of Biological Chemistry**, Richard Sobe and colleagues at Appalachian State University identify a polyamine called spermine that, at the concentrations typically present in the human gut, prevented V. cholerae biofilm formation. Thus, spermine may be an environmental signal that induces the pathogen to grow planktonically in the intestine, a state in which it can produce virulence factors.
doi: 10.1074/jbc.M117.801068

Combo shows promise for treating lipid disorder

Patients with familial dysbetalipoproteinemia, or FD, have elevated cholesterol and triglycerides. The buildup of large lipoproteins can manifest in yellowish or orangey fat deposits under the skin of the palms, elbows, knees, feet and eyelids. The disease, caused by a defect in the gene apolipoprotein E, leads to premature hardening of the arteries, formally known as atherosclerosis. Patients usually need to adjust their diets and lifestyles and take cholesterol-lowering statins, but even then they may remain at increased risk of heart disease. Researchers at the University Medical Center Utrecht recently reported in the **Journal of Lipid Research** that adding a fibric acid derivative to lipid-lowering regimens seems to be beneficial for these patients. Fibrates have been known to reduce very low-density cholesterol and speed the removal of triglycerides from the blood. The team, led by Frank L.J. Visseren, conducted a randomized, placebo-controlled, double-blind study of 15 patients. "(T)he addition of bezafibrate to standard lipid-lowering therapy resulted in lower fasting and post-fat-load plasma lipids, which may significantly affect atherogenesis in FD (patients)," the authors wrote. "Combination therapy of statin/fibrate could be considered as standard lipid-lowering treatment in FD patients." Bezafibrate, marketed under the brand name Bezalip and others, is an agonist of the dietary lipid sensors called peroxisome proliferator-activated receptors, or PPARs.
doi: 10.1194/jlr.M076901

Why HIV combo therapies don't work as expected

Second-line anti-HIV drugs include co-receptor antagonists and fusion inhibitors, which prevent viral entry into cells via different mechanisms. These drug classes are expected to act synergistically, but in practice sometimes they do not. In the **Journal of Biological Chemistry**, Koree Ahn and Michael Root of Thomas Jefferson University report that the strength of synergy between co-receptor antagonists and fusion inhibitors depends on co-receptor density and drug-target binding affinity. These results clarify steps in the HIV fusion process and suggest factors to consider when developing combination therapies.
doi: 10.1074/jbc.M117.791731

A regulatory protein that aggregates in brain cancer

Gliomas are deadly brain cancers whose progression is strongly associated with overexpression of the RNA-binding regulatory protein HuR. Using clinical brain tumor samples, Natalia Filippova and colleagues at the University of Alabama show in a paper in the **Journal of Biological Chemistry** that increasing tumor severity was associated with increased multimerization and aggregation of HuR. They also identified the domains involved in multimerization, suggesting drug targets for slowing tumor progression.
doi: 10.1074/jbc.M117.797878

The sleeping sickness pathogen complex

The protozoan parasite Trypanosoma brucei is a pathogen that causes

Why don't long-lived whales develop cataracts?

In America, more than half of people age 80 and older have or have had cataracts. Other species also experience the lens clouding, which can cause blindness. Dogs, for example, typically live a decade or more and develop cataracts around age 6. (That's around 42 in dog years.) Rats live a few years on average in labs and develop cataracts around age 2. Interestingly, bowhead whales are believed to live up to 200 years, which puts them among the longest-living mammals, and yet they do not develop cataracts. Researchers recently set out to study the whales' specially adapted eyes to figure out why that might be the case. The research team, led by Douglas Borchman of the University of Louisville, collaborated with the Alaska Department of Wildlife Management. The department has a decades-long relationship with Eskimo whaling captains authorized by the International Whaling Commission to conduct subsistence hunts twice annually. Over the years, great numbers of whale eyes have been preserved for study. And what did all those eyeballs reveal? "We found that whale lenses have one of the highest sphingolipid contents of lenses from the species studied," the authors reported in the **Journal of Lipid Research**. "Lens membranes with a high content of saturated sphingolipids … are less susceptible to oxidation because there is relatively less oxygen in these ordered bilayers, as well as fewer double bonds to become oxidized … (W)hale lens lipid composition and structure support the finding that lens lipid hydrocarbon order is directly related to the sphingolipid content and indirectly related to the phosphatidylcholine content of the lenses of many animals." The authors said the strong correlation between sphingolipid composition and animal lifespan is worthy of additional study.

doi: 10.1194/jlr.M079368

COURTESY OF NORTH SLOPE BOROUGH, DEPARTMENT OF WILDLIFE MANAGEMENT, UTQIAGVIK, ALASKA

The external eye anatomy of the bowhead whale shows a small palpebral fissure and thick and fleshy palpebra with a thick overlaying epidermis that protects the whales' eyes from the extreme arctic environmental conditions, allowing them to maintain vision throughout their long lives.

sleeping sickness, with an estimated 20,000 case per year. Although the genomic sequence of T. brucei has been reported, many of the predicted proteins lack classifiable homology to known proteins in other organisms, hindering efforts to understand its biology and discover potential therapies. In a study published in **Molecular & Cellular Proteomics**, investigators at the University of Dundee led by Michael Ferguson performed a protein correlation profiling approach using mass spectrometry to identify protein complexes from T. brucei. They identified and quantified profiles for 6,004 protein groups, from which 234 protein complexes were predicted. The data generated from the study were incorporated in an accessible online database as a resource for trypanosome biologists.

doi: 10.1074/mcp.O117.068122

Vitamin D activation beyond the kidneys

Vitamin D is converted into its active form primarily in the kidneys in an endocrine-regulated process, but a small amount of vitamin D activation occurs in nonrenal cells and is regulated by inflammation. Understanding vitamin D biology has been hampered by the inability to disentangle endocrine and inflammatory regulation in vivo. In a paper in the **Journal of Biological Chemistry,** Mark Meyer and colleagues at the University of Wisconsin describe how they discovered a kidney-specific enhancer of vitamin D activation that specifically affects skeleton formation, paving the way for future studies.

doi: 10.1074/jbc.M117.806901

Serpin mechanisms in blood disorder patients

Antithrombin deficiency is a rare blood disorder that greatly increases the risk for life-threatening blood clots. Many individuals with antithrombin deficiency have mutations

Characterizing plant hormones

Plants secrete a diverse set of peptides that play crucial roles as signaling molecules to influence growth and development. However, many of these plant hormones have not been characterized. Investigators at Australian National University led by Michael Djordevic developed a mass spectrometry and bioinformatics strategy to identify the secreted peptidome from the roots and xylem sap of Medicago truncatula, a model plant organism for legume biology. They identified 759 spectra corresponding to 12 peptide hormones with different post-translational modifications. The modifications were shown to be important in the signaling roles of the peptides as demonstrated by the ability of hydroxylation at key positions in CEP peptides to elevate root nodule number. The study was published in **Molecular & Cellular Proteomics**.
doi: 10.1074/mcp.RA117.000036

COURTESY OF NINJATACOSHELL, WIKIMEDIA COMMONS

This is a shoot of a 4-week-old Medicago truncatula, also called barrel clover, a small annual legume.

affecting antithrombin's reactive center loop, which inserts into thrombin's active site to inhibit it. In the **Journal of Biological Chemistry**, Sonia Aguila and colleagues at the Universidad de Murcia describe how they identified an additional set of antithrombin deficiency–associated mutations in the distal region of antithrombins and showed that this domain is essential for the final steps of thrombin inhibition.
doi: 10.1074/jbc.M117.787325

The antibody repertoire of colorectal cancer

The immunoglobulin genes that code for antibodies are highly rearranged in the genome, causing missed identifications of antibodies in mass spectrometry searches. A team led by Vineet Bafna at the University of California–San Diego developed a novel proteogenomic approach to identify the highly variable antibody peptides by developing a customized antibody database construction method. The tool, called AbScan, was used to create an antibody database from colorectal tumor samples using RNA-seq data, which then was used to search the mass spectrometry data. The study, reported in **Molecular & Cellular Proteomics**, identified 1,940 distinct antibody peptides in colorectal cancer. AbScan is freely available and can be used for understanding the immune response in other cancers.
doi: 10.1074/mcp.RA117.000397

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Angela Hopp (ahopp@asbmb.org) is executive editor of ASBMB Today and communications director at the ASBMB.

Saddiq Zahari (szahari@asbmb.org) is a postdoctoral scholar at the University of California, San Francisco, and the editor for manuscript integrity at Molecular & Cellular Proteomics.

New in 2017: ASBMB associate editors

The American Society for Biochemistry and Molecular Biology is happy to welcome these new associate editors to our journals:


CARMAN

George Carman is a professor of food science and founding director of the Rutgers Center for Lipid Research, Rutgers University. He started Jan. 1 as an associate editor for the Journal of Lipid Research.


DEBOSE–BOYD

Russell Debose–Boyd is a professor of molecular genetics at the University of Texas Southwestern Medical Center. He started Jan. 1 as an associate editor for the Journal of Lipid Research.


FLEMING

Karen Fleming is a professor of biophysics at Johns Hopkins University. She started July 1 as an associate editor for the Journal of Biological Chemistry.


HANSON

Phyllis Hanson is a professor of cell biology and physiology at Washington University. She started Nov. 1 as an associate editor for the Journal of Biological Chemistry.


JAKOB

Ursula Jakob is a professor of molecular, cellular and developmental biology and a professor of biological chemistry at the University of Michigan Medical School. She started Sept. 26 as an associate editor for the Journal of Biological Chemistry.


MUSIER–FORSYTH

Karin Musier–Forsyth is a professor of chemistry and biochemistry at the Ohio State University. She starts Jan. 1 as an associate editor for the Journal of Biological Chemistry.


PETI

Wolfgang Peti is a professor of chemistry and biochemistry at the University of Arizona College of Medicine. He started Feb. 1 as an associate editor for the Journal of Biological Chemistry.


SCHAFFER

Jean Schaffer is a professor of medicine at the Washington University School of Medicine. She started July 1 as an associate editor for the Journal of Lipid Research.


TANG

Qi-Qun Tang is a professor of biochemistry and molecular biology at Fudan University Shanghai Medical College. He started Nov. 1 as an associate editor for the Journal of Biological Chemistry.


WHITFIELD

Chris Whitfield is a professor and Canada research chair, Department of Molecular and Cellular Biology, University of Guelph. He started Jan. 1 as an associate editor for the Journal of Biological Chemistry.

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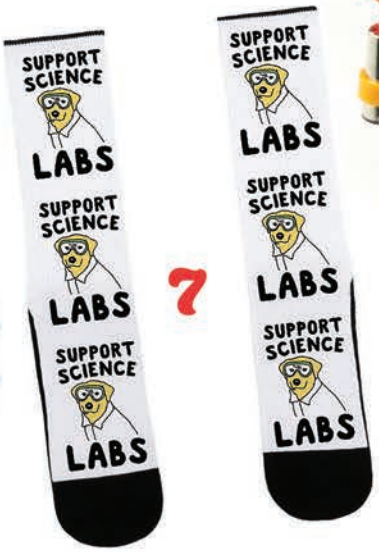

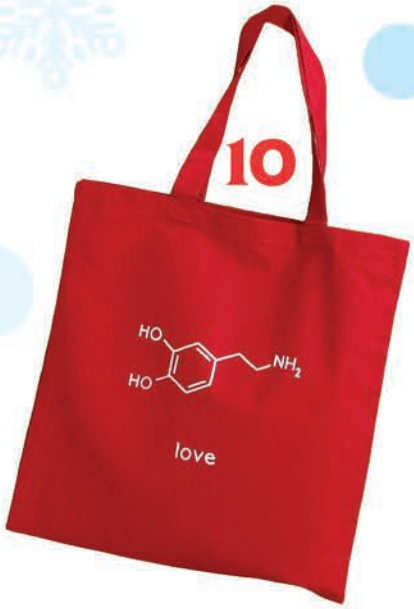

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Meet Martin Spiering

JBC technical editor helps authors finesse their titles and abstracts

By Angela Hopp

Over the past year, Martin Spiering has worked on more than 1,300 papers submitted to the Journal of Biological Chemistry. As the journal's technical editor, he's tasked with evaluating the effectiveness of each paper's title and abstract and with advising authors on how to improve them when needed.

The workload is significant. The journal publishes several papers on any given day. His duties are intellectually challenging, because JBC covers a broad range of biological chemistry.

"It's a lot to get one's arms around, and it's actually a fun experience as well," Spiering said. "I wouldn't have started on this project if it would've meant just dredging along, (doing) repetitive work. I enjoy wordsmithing, digging into details and making something that is good even better."

Spiering earned his master's degree in biology from the Free University Berlin in 1995 and his Ph.D. in microbiology from Massey University in New Zealand in 2000. He did postdoctoral work at the University of Kentucky and Trinity College, Dublin, and was a senior scientist at the University of Maryland. He also worked as a freelance manuscript editor for a few years before formally embarking on his editorial career in 2013, first as a science editor and project manager for a federal contractor assigned to the National Institutes of Health. He joined JBC in the summer of 2016.

He spoke to ASBMB Today's executive editor, Angela Hopp, about his work at JBC. The interview has been edited for space and clarity.

Could you talk a little bit about the service that you provide to JBC authors?

In a nutshell, I'm helping authors craft better and more compelling titles and abstracts. So I'm dealing only with the most visible parts of their papers — the idea being that a clear and interesting title will draw readers in and an easy-to-read and well-structured abstract will prompt readers to delve more deeply into the work.

How do you think providing that service fits into the bigger picture for JBC? Yours is a relatively new position, and it's obviously something the JBC editors care about, but why?

There seems to be this productive confluence of ideas at the moment to find ways to make the journal better and to distinguish it from similar journals in the field. The scientific publishing arena has become very competitive, and one way to raise the bar is to improve presentation — to bring out the aspects of a paper that are likely of great interest to readers and put these pieces clearly in front of them.

Along with this effort, JBC is also rapidly expanding its social media

reach, and we also have more outreach to JBC's audience, prospective authors and the scientific community at large through the associate editors, who deeply care about the journal. So this service fits into the larger picture of adding value to both authors and readers and maintaining and even expanding the wide reach of the journal.

You get to see, probably more even than the JBC editors, the breadth of the journal.

Oh, yeah — JBC has a big scientific footprint. I think one challenge of my job is that JBC is a generalist journal. Each paper is so vastly different. It may be about cell signaling, DNA replication or sophisticated structural analysis, and some papers even report on early-stage therapeutics for a variety of diseases. It's always concerned with the vast field of biology, including, obviously, biological chemistry and also molecular and structural biology and so forth.

What I bring to the table is that I often look from the vantage point of the naïve reader. If the work seems confusing or doesn't seem well presented in the title or abstract or if there are holes in the presentation or narrative, I can make suggestions for how to fill these holes and how to make the text flow better.

Do you find that authors are generally receptive to your advice?

They're mostly immensely grateful. From the feedback I get, they're really appreciating the journal for providing that service. And I think they really like the fact that someone engages with their thoughts and findings. Sensing that there's someone who cares about their work also brings home to them that they have to do their best to deliver a good take-home message to readers.

The editorial suggestions I provide are just that: suggestions. The authors are under no obligation to use all or even any of them. This injects an air of collaboration into the process that I think many authors value. And sometimes a suggested edit may just give them something to play with, to look for an even better expression that drives home or clarifies an important point.

EMILY HUFF/ASBMB

As technical editor of the Journal of Biological Chemistry, Martin Spiering says he helps authors "craft more compelling titles and abstracts."

I bet the authors that you work with put more care into it the next time they write a title or abstract.

I hope so. The goal also is that we are regressing to a mean that is a better mean than before. When prospective authors see better titles and abstracts in the recent issues, they realize that they have to take it up a notch. And I think that's the idea: It's lifting all the boats to make both papers and the journal better.

What are the most common mistakes you see?

The most common ones I come across are using arcane abbreviations

and acronyms, especially in titles. They may be field-specific, and maybe that's appropriate, but it can get in the way of the broader audience reach that JBC aspires to.

Another pitfall for authors is not providing enough background: Why do we need to study this? One or two sentences in the beginning saying that this is a broad topic of interest and what's unknown about it and how the authors' work fits in can really help engage readers and ease them into the paper. So lack of a good structure that takes the reader by the hand is something I encounter a lot.

I should say that by and large, and as one would expect, many JBC authors are quite good at stringing words together. But sometimes the logical connections between sentences or sections are not there. Many authors are prone to present one result, another result, yet another result and then sometimes a conclusion. And then you think, "OK, that conclusion sounds great, but how do these other parts really lead to it? How do they connect with each other to form that bigger picture the authors seem to allude to?"

So these are the most common things that I'm seeing.

I think you're saying that often there's a lack of cohesion. You have to work, as a writer, to make the connections between pieces or information, between sentences.

Cohesion is one thing that's often missing in the abstract, and sometimes authors are surprisingly unforthcoming with the fact that they found something really interesting. I always look at a paper's referee reports, and sometimes a referee may mention some key result that I didn't see in the abstract, and I look in the paper, and sure enough it's there. And the referee got quite excited about it. So I have to point out to the authors, maybe you want to include this in the abstract or even title. It doesn't happen all too often, but it does happen. It's surprising because, again, the title and the abstract are the elements everybody sees, and so you have to make the best effort to bring out everything there.

Do you think that maybe that happens because the person writing the abstract is just so close to it?

Exactly. By providing another set of eyes, you avoid this writer's bias. People writing from their own, well-informed perspective think, "Because I know it, everybody else should know it." And that's, I think, one of the principal functions of an editor: to provide that perspective of the somewhat clueless reader. You say, "No, actually, I don't know this very well. Maybe I'm too dense for this. But I suspect others don't know either. So here is a possible idea for how to present this a little better."

Interested in getting advice from Martin?

Martin and other JBC staff will be providing advice and answering questions in webinars about scientific writing and publishing. To sign up to receive information about upcoming webinars, visit https://asbmb.realmagnet.land/JBCwebinars.

Angela Hopp (ahopp@asbmb.org) is executive editor of ASBMB Today and communications director at the ASBMB.

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The circadian coupling of cellular and solar clocks

Three American scientists won a 2017 Nobel Prize for discovering the mechanisms that affect myriad aspects of physiology by making our cellular clocks tick in time with the Earth's revolutions

By John Arnst

COURTESY OF WIKIMEDIA COMMONS

Engraved portrait of French astronomer and geophysicist Jean-Jacques d'Ortous de Mairan (1678-1771) by Simon Charles Miger (1736-1828). D'Ortous de Mairan noticed that the leaves of a mimosa plant continued to open and close in sync with daylight hours, even when the plant was kept in darkness.

If you have a plant on your windowsill, it likely expands its leaves during the daylight hours and contracts them at night. It's less likely that you've shoved your plant in a dark closet and checked in on it throughout the day, but if you had you'd have noticed that it keeps up this behavior, caused by its circadian rhythm, even in the absence of sunlight.

Circadian rhythm is a molecular dance that runs on a roughly 24-hour clock — slightly longer and shorter in some organisms —affecting a vast number of physiological systems. Long before scientists uncovered the process in human cells, people observed it in the movement of plants' leaves.

The earliest written description of circadian rhythm dates to around 400 BC; a Macedonian ship's captain named Androsthenes noted that the leaves of tamarind trees open toward the sun during daylight hours and close up at dusk. This diurnal behavior was further explored more than 2,000 years later when French scientist Jean-Jacques d'Ortous de Mairan noted in 1729 that the leaves of the mimosa open and close in sync with daylight even when the plant is kept in darkness, suggesting an endogenous, or internal, factor is at play.

This internal factor, a feedback loop that coordinates a number of cellular processes in a 24-hour period, has been identified and studied extensively in a number of model organisms, including fruit flies, mice and humans. It is believed to be present in various permutations in nearly every organism on Earth. Over the past two decades, researchers the world over have continued to probe the feedback loop that maintains the circadian rhythm and the cycle's effects on numerous aspects of human physiology, including wound healing, cardioprotection, chemotherapy and pharmacology.

This year, the Nobel Committee awarded its prize for physiology or medicine to American chronobiologists Michael W. Young, Jeffrey C. Hall and Michael Rosbash for their seminal work in the 1980s and '90s uncovering the molecular mechanisms that drive the circadian rhythm in Drosophila melanogaster, or fruit flies.

According to Frank A.J.L. Scheer, a professor at Harvard Medical School and the director of the Medical Chronobiology Program at Brigham and Women's Hospital, the laureates' work put the circadian field on the map. Their research "gave a lot of recognition to the field of circadian biology," Scheer said. "It made it very concrete. It allowed researchers to develop tools to study cause and effect to manipulate particular core clock molecules."

The process was slow going at first. After Hall, Rosbash and Young isolated and cloned the first gene that was found to be essential for circadian rhythm in 1984, its function remained unclear for a number of years.

"Animals are rhythmic organisms, and that was something that became apparent as we learned the pieces of this machine by collecting genes, but it certainly wasn't in our heads at the beginning," said Young. "Our three small labs got things rolling many years ago, but what's been very pleasing is how it's been amplified by findings in so many different systems now."

A brief history of cellular time

After scientists in the 18th and 19th centuries observed that a variety of organisms continued to display 24-hour behavior when kept in darkness, the geneticist Seymour Benzer and his student Ronald Konopka in 1971 used mutagenesis studies in fruit flies to identify a causative gene, which they named "period."

This gene codes for a protein, PER, that maintains the circadian rhythm by a negative feedback loop in which the protein accumulates in an organism's cellular cytoplasm at night and moves to the nucleus shortly before the organism wakes up, where it inhibits its own synthesis. The protein then degrades in both the nucleus and cytoplasm. Similar 24-hour feedback loops have been found in several species of plants and fungi and are believed to be present in all eukaryotes, despite variations in the structures of the responsible genes and proteins.

COURTESY OF NATÜRLICHE PFLANZENFAMILIEN. VOL. III, 3 (1891)

The tamarind plant, illustrated here, was documented as displaying circadian behavior about 2,400 years ago.

Steve Kay, a chronobiologist at the University of Southern California, is a longtime collaborator with Hall. "Even though the names of the proteins and even the homology of the proteins might be different across the kingdoms of the eukaryotes, the fundamental core mechanism appears to be very similar," Kay said.

Although it uses a markedly different set of proteins, a version of the circadian rhythm has even been observed in prokaryotes, which eukaryotes diverged from billions of years ago. "We know for sure that clocks have evolved independently multiple times, because it's clear that the clocks that we find in prokaryotes, notably the clock that was defined in cyanobacteria, is absolutely different from the clock we find in eukaryotes," Kay said.

COURTESY OF MARIO MORGADO

Michael W. Young is the Richard and Jeanne Fisher professor and vice president for academic affairs at the Rockefeller University.

COURTESY OF MIKE LOVETT

Jeffrey C. Hall lives in Cambridge, Maine, and is a professor emeritus of biology at Brandeis University.

In humans, the levels of PER have profound effects on heart rate, blood pressure, metabolism, body temperature and hormone levels. As such, the circadian rhythm is responsible for a number of physiological changes throughout the day — a halt in secretion of the hormone melatonin shortly before waking up; bowel movements and high alertness in mid-morning; subsequent peaks in coordination, reaction time, cardiovascular efficiency and muscular strength throughout the afternoon; and the onset of melatonin secretion in the evening, leading to sleep.

After Hall and Rosbash at Brandeis University and Young at Rockefeller University isolated and cloned the period gene from fruit flies in 1984 and, shortly thereafter, isolated PER, the researchers quickly ran into a problem when it came to deducing the protein's function based on its structure.

"Sequencing the period gene's informational content led to an on-paper protein that is large, 1,200 amino acids, but it was totally featureless," Hall said. "This molecular identification of the gene and then characterization of the gene took the whole enterprise out into terra incognita. We had identified a completely novel protein that nobody had ever seen before."

The three research groups worked to gradually define the structure and function of the PER protein, as well as search for other genes responsible for the circadian rhythm. Hall and Rosbash discovered in 1988 that PER's level fluctuates throughout the night and early morning. In 1998, after discovering rhythms in period mRNA levels that were shortened, lengthened or deleted depending on mutations to the period allele, they proposed that an inhibitory feedback loop allowed the PER protein to control the cycling of the period gene's expression. In 1992, Hall and Rosbash found that this feedback loop is transcriptionally regulated, implying that PER regulates its own transcription and possibly that of other genes that control physiology and behavior. In 1994, Young's laboratory found a missing piece of the feedback loop: a second gene, timeless, that coded for a protein, TIM (pronounced "time"). This protein binds to PER proteins in the cytoplasm and ferries them into to the nucleus, where they block the period gene from further synthesizing PER proteins. A few years after discovering TIM, Young's lab found another protein, DOUBLETIME, which phosphorylates the remaining PER proteins to mark them for degradation.

A postdoctoral fellow in Young's lab, Amita Sehgal, now at the University of Pennsylvania, cloned the tim gene mutant in 1995. Soon thereafter, Sehgal started her own lab at the University of Pennsylvania and she and Young continued to collaborate to clone the tim gene. Subsequently, the Sehgal lab discovered that light degrades TIM, which causes the circadian rhythm to adjust after external conditions, such as what time of day the sun is in the sky, have changed.

Circadian and sleep

If you've ever traveled across multiple time zones, you likely felt groggy for a number of days. This phenomenon, jetlag, is caused by a temporary mismatch between your sleep cycle and circadian rhythm.

John Ewer, a chronobiologist at the University of Valparaiso in Chile, joined Hall's lab at Brandeis in 1985 as a graduate student. "If you go to Tokyo tomorrow, you'll wake up at the time of wherever you started off from, and then, little by little, your time will shift," he said. "That's a reflection of the fact that the clock is running in you in a phase that is imposed by the light-dark cycle where you started."

This phase, during which the circadian rhythm affects certain processes,

will remain constant throughout an organism's life if not externally altered. This has been observed in fruit flies, which will display the same phase if consistently exposed to 24-hour light cycles as larvae and then raised in darkness through adulthood without the clock's activity being reset by light exposure.

While circadian rhythm exhibits an effect on sleep cycles, including secretion of melatonin, the two act by separate pathways. In a preindustrial world, the pathways largely would have operated in sync, but the advent of electrical lighting and shift work have combined to disrupt them for a significant portion of the population.

"If you're up all night, and sleep in the morning, your (circadian) clock is telling you to wake up, and at that point your sleep system has to suppress the circadian-induced activity to allow you to sleep," Sehgal said. This circadian misalignment has been linked to higher blood pressure, an increase in inflammatory markers and cholesterol levels, and a decrease in insulin sensitivity and glucose tolerance.

Despite the interaction between the pathways for sleep and the circadian rhythm, research involving each occupies distinct fields, Sehgal said. She and her collaborators have developed a Drosophila model for sleep, and are investigating the neurocircuitry of sleep pathways in fruit flies. "The sleep field is, I would say, 15 years behind the circadian field," she said. "We're starting to get a framework for circuits, but not necessarily what's happening during sleep."

Body clocks in medicine

While the mechanisms by which the clocks in every organ and cell communicate with one another to stay synchronized are still being puzzled out, researchers are investigating aspects of physiology, such as the breakdown of blood clots, wound healing and the morning peak of cardiovascular risk factors, that are under circadian influence.

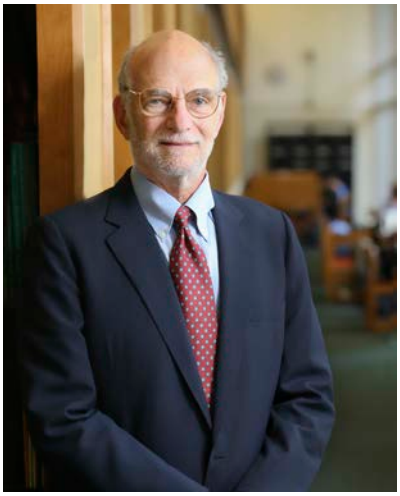
In a study published in November in the journal Science Translational Medicine, scientists studying fibroblasts, the skin cells essential for healing, in mice, found that proteins that direct the cells' activity are more active at night, when the mice are active. The researchers found that when the mice were injured during normal waking hours, the wounds healed significantly faster than those that occurred in the hours that mice would normally be sleeping.

Proteins with levels affected by the circadian rhythm also play a role in protecting cardiac cells from damage suffered during low-oxygen conditions, or hypoxia. Following up on observations that people who have heart attacks in the morning tended to fare worse than people who have them in the afternoon, scientists at the University of Lille in France reported in The Lancet in October that using antagonist molecules to decrease the signaling of a circadian rhythm–linked protein, Rev-erb alpha, decreased the rate of hypoxia-related damage to mouse cardiac cells that were damaged close to the time that they woke up.

Despite being nocturnal, mice displayed a similar pattern of increased cardiac injury as the humans and had more persistent damage when injured closer to the time that they woke up. By comparing the transcriptomes of human patients who underwent heart surgery in the morning and afternoon with the transcriptomes of mice with heart cells damaged during the sleep-to-wake transition and the wake-to-sleep transition, the researchers were able to hone in on the gene P21. The protein produced by this gene previously had been demonstrated to protect cardiac cells from damage accrued by hypoxic conditions. The researchers used small molecules to decrease the signaling between Rev-

COURTESY OF WIKIMEDIA COMMONS

Much like those of the mimosa and tamarind plants, the leaves of the silk plant open during the day and close during the night.



COURTESY OF MIKE LOVETT

Michael Rosbash is the Peter Gruber endowed chair in neuroscience and a professor of biology at Brandeis University.

erb alpha and this gene, finding that, after doing so, mice with heart cells damaged in the sleep-to-wake group fared as well as their counterparts that were injured later in their active period.

"If there is a specific role for Rev-erb alpha, it's quite difficult to say," said David Montaigne, the first author on the Lancet paper. "It's one of the necessary parts of the circadian clock, so its absence would be quite problematic for the cell." Montaigne and his colleagues hope to develop a drug based on the small molecule that could be used to minimize cell death and damage in human patients during strokes and heart attacks.

Clockwork's edge

As a new generation of scientists continues to unravel the effects the circadian clocks have on human physiology, the Nobel laureates and other chronobiologists are investigating the near-invisible molecular interactions that cause circadian rhythm to operate in a 24-hour cycle.

"We really, to this day, don't understand how the clock runs at a 24-hour pace," said Paul Hardin, a chronobiologist at Texas A&M University who helped demonstrate, while he was a postdoctoral researcher in Rosbash's lab in the early '90s, that mutant versions of the period gene affected PER mRNA transcription and the length of the circadian rhythm's period. "What is important from here on out in model organisms is to understand how transcription is controlled, how those transcriptions control overt rhythms, and how that can be translated to bettering human health."

Rosbash's lab at Brandeis is investigating this molecular activity, as well as the clock's ability to operate consistently in changing temperatures. Unlike many other enzymatic reactions, which tend to speed up when ambient temperature increases, he said, the mechanisms of the circadian rhythm in fruit flies haven't been observed to accelerate within the ambient temperature range between 18 degrees and 29 degrees Celsius (64 degrees and 84.2 degrees Fahrenheit), an unexplained physiological anomaly.

"I think the two interesting frontiers, really, are the details of timing," he said. "Why is a fruit fly's period 23.8 hours and a human's 24 hours and 15 minutes and not 22 or 2? And coupled to that is this terribly interesting problem of temperature compensation in circadian biology."

The difference between the 24-hour solar cycle and the 24-hour–15-minute human circadian rhythm is subtle but crucial, Scheer said. "That may seem kind of trivial, the distinction, but of course, it has big influences on whether the circadian system can easily be entrained to the Earth day and also whether it could be entrained to other days, such as the cycle length on the planet Mars, which is 24.65 hours long."

Young's lab is exploring mutations in humans responsible for delayed sleep disorder, in addition to mutations in fruit flies that are responsible for the duration of sleep.

"Every time I hear someone say we've learned all we can from model organisms, I see something pop up that proves that we've just opened a new door," Young said. "The work that was done in Drosophila so clearly set the path for the understanding of circadian biology in every system, and it's impossible to imagine having started in a more complicated system and had the wherewithal to be where we are today."

John Arnst (jarnst@asbmb.org) is ASBMB Today's science writer. Follow him on Twitter @arnstjohn.

Beyond the big talks

A preview of offerings at the ASBMB annual meeting

It's more than four months away, but the committees and staff of the American Society for Biochemistry and Molecular Biology are already planning programs and activities for the 2018 annual meeting in San Diego. Just in case you need a nudge to hit that Feb. 27 early registration deadline, here's a general preview of all the great stuff we have on tap. We'll provide time and place details in an issue closer to the meeting dates of April 21-25.

Outreach

Pitches, posters and presentation

Since 2013, the Public Outreach Committee has been encouraging ASBMB members to reach out of their comfort zone and engage with the public. We are continuing this tradition by offering several exciting sessions at this year's annual meeting.

Do you run a science outreach or communication program at your university? If so, please submit an abstract to present your work at the Science Outreach Poster Session, which will be held during the Experimental Biology welcome reception. This event allows you to share your public engagement activities and programs with the entire EB community. If you're not involved with outreach, this poster session is a great way to learn more about developing informal education experiences in your area.

In collaboration with local outreach organizations, we are hosting a Transforming Science Research into Science Outreach Workshop. Our panelists will share how their outreach programs were inspired by current research and give advice on how to expand, improve or even just start your own public engagement activity. Armed with this knowledge, you can create an outreach event inspired by your research and aimed at your audience of choice.

You don't need to host an event to do outreach, though. Outreach can be as simple as sharing your research with a friend or neighbor.

COURTESY OF ACTIONFOTO CONVENTION PHOTOGRAPHY

Attendees mingle and gain valuable experience presenting their research at the undergraduate poster competition during the 2017 ASBMB annual meeting in Chicago. The 2018 competition will be held April 21 in San Diego. For the 2017 results and information about next year's contest, go to asbmb.org.

However, it's hard to create a brief, exciting narrative that will encourage laypeople to learn more. The interactive Constructing Your Elevator Pitch Workshop will guide you through the process of creating and delivering an effective statement. Presenters will discuss real-life approaches to communication that work (and don't work) and offer plenty of opportunities for practice and feedback. The skills you'll gain are not just valuable for communicating with the lay public but with other academics, government officials and potential employers as well.

Every day, professional communicators like journalists use storytelling strategies to capture their audience. So why not tell a story in your scientific presentations? Storytelling and the Art of Giving a Good Presentation is an interactive session that will help you create a compelling narrative with your research. You'll get presentation tips from professional storytellers, plus the opportunity to put your new skills to work.

— Danielle Snowflack

Publications

New insights, voices and opportunities

April is our favorite month in the publications department, because the ASBMB annual meeting gives us a chance to meet the Journal of Biological Chemistry, Journal of Lipid Research, and Molecular & Cellular Proteomics authors we've been working with all year and learn about their latest research.

We're delighted that Gerald Hart, associate editor of MCP and JBC (and incoming ASBMB president), has won the Herbert Tabor Research Award; he will give his award lecture on nutrient regulation of signaling and transcription. At his lecture, JBC will also unveil the winners of the revamped JBC/Herbert Tabor Young Investigator Awards, which honor the first authors of the very best papers published in JBC. These rising stars will have a chance to address the crowd during their Spotlight Talks. At JBC, we look forward to a redesigned publishing workshop, where we'll help authors prepare compelling titles and abstracts, make sure their data are unassailable and spread the word about their research. In addition, we'll seek feedback about other ways JBC can support the biological chemistry community and about potential changes in journal policy and upcoming initiatives. Also, the April meeting is JBC's yearly reunion with its editorial board members and gives us a chance to discuss best practices in peer review to ensure consistency and fairness.

The annual meeting will have a symposium on lipid signaling and metabolism, at which JLR Associate Editor Michael Wakelam of the Babraham Institute will give a talk on using lipidomics pathway analysis to identify therapeutic targets. Dennis Voelker, winner of the Avanti Award in Lipids, will give a lecture about phospholipid regulation of inflammatory processes and viral infection. The editors of JLR will pay close attention to the Spotlight Talks, as the journal is just wrapping up an eight-review series on the major risk factor for Alzheimer's disease, apolipoprotein E, and it's time to get inspired for the next one.

MCP is proud to sponsor a symposium on systems biology and proteomics. Deputy Editor Steven Carr of The Broad Institute will talk about new approaches for subcellular localization of proteins and their interaction partners with high spatial resolution. The other speakers include MCP editorial board members Ileana Cristea of Princeton University and Heng Zhu of the Johns Hopkins University School of Medicine. Additionally, the MCP team will be looking for feedback on the journal's implementation of new guidelines and requirements for targeted mass spectrometry papers.

— Catherine Goodman

Student chapters

Opportunities for undergrads

The ASBMB Student Chapters is a program for undergraduate students and faculty members that provides networking and career-development opportunities and resources for research and science outreach. Each year, the Student Chapters Steering Committee hosts two networking events at the ASBMB annual meeting.

At the first event, Organizing a Successful ASBMB Student Chapter, members of Student Chapters share tips and ideas for organizing chapter activities, scientific meetings and outreach events. Student and faculty members of the ASBMB Student Chapters program and those interested in starting a chapter are encouraged to attend.

During the ASBMB Student Chapters advisers' networking reception, chapter advisers have the opportunity to network with members of the Student Chapters Steering Committee and other advisers. Faculty members interested in starting a chapter also are encouraged to attend.

— Nadine Gombakomba

Minority affairs

An in-depth look at RNA

The ASBMB Minority Affairs Committee is excited to bring cutting-edge scientific talks, networking opportunities and professional development opportunities for trainees to the 2018 ASBMB annual meeting.

The MAC is bringing together leading scientists to present on recent work in the field of RNA biology. Join them for sessions on RNA Form and Function, RNA in Human Disease, and RNA-mediated Epigenetics as a part of the MAC-presented Issues in Depth symposia series, Gilded Strands: RNA Form, Function, and Role in Human Diseases. Each year, the MAC Issues in Depth symposia series offers presentations on recent scientific advances and the societal

implications of these advances, especially on minority populations.

Join the MAC at the ASBMB welcome and networking reception. Learn about MAC programs, including the Interactive Mentoring Activities for Granstmanship Enhancement grant-writing workshop, held every spring, and the Marion B. Sewer Distinguished Undergraduate Scholarship, awarded annually. See the work of travel awardees in the reception's poster session, and mingle with fellow scientists interested in supporting diversity and inclusion in BMB.

Are you an underrepresented minority graduate student, or do you know any? The MAC encourages URM graduate students to apply for the Graduate Student Travel Award supported by the committee. In addition to receiving travel funding, recipients of this award will have the opportunity to participate in ASBMB professional development programming, present a poster of their work at the ASBMB welcome reception and be paired with an individual mentor to meet with at the annual meeting. This is a fantastic opportunity for students to engage with meeting programming and receive travel funding.

— Allison Goldberg

Public affairs

Advocacy initiatives

Following on last year's success, the Public Affairs Advisory Committee again will host an advocacy town hall for ASBMB members. Join PAAC Chair Matt Gentry (from the University of Kentucky) and Public Affairs Director Benjamin Corb as they discuss the PAAC's activities on behalf of the community in the previous year, describe exciting new initiatives being offered to ASBMB members to get involved in advocacy, and answer your questions about the latest science policy news and information. The PAAC also will bring guest speakers to discuss relevant and timely science policy issues. Lunches will be made available.

— Benjamin Corb

Education and professional development

Science meets marketing

The ASBMB Education and Professional Development Committee has organized a program of annual meeting sessions and workshops around the theme Science Meets Marketing: The Key to a Successful Career.

With the diverse career options available for scientists and a rapid increase in the use of online profiles, it's important to prepare a professional profile that helps promote specific career objectives. In a session on Strategically Building Your CV at Every Career Stage, speakers from academia and industry will present strategies that students, trainees, faculty and industrial scientists can use to ensure that their experiences are leading to their desired career path and they are marketing themselves to achieve their career goals.

This program will be followed by a hands-on workshop where attendees can discuss how experiences link to a specific career path, along with tools for marketing themselves. Participants will be divided into groups based on their interests and career level, and session speakers will facilitate discussions within each group. While all career stages can benefit from this workshop, students, postdocs and early-career scientists are urged to attend. Your next job could depend on it.

Have you ever been the expert in the room trying to explain your science and your audience just does not get your message? Effectively telling your scientific story is vital to a successful career. A session on Communicating Scientific Ideas to Novice Audiences will bring together speakers from diverse backgrounds to discuss communicating science effectively to nonexpert groups. Even experienced communicators will benefit from the cross-disciplinary interactions in this session.

COURTESY OF ACTIONFOTO CONVENTION PHOTOGRAPHY

Najijah Aziz, a research technician at Massachusetts General Hospital, presents her work at the 2017 Experimental Biology conference at McCormick Place in Chicago. The yearly conference includes the ASBMB annual meeting.

A workshop on Molecular Visualization will present practical knowledge for how to communicate molecular structure/function using low-cost but powerful methods. Techniques for using molecular visualization software to effectively convey structural features will be demonstrated. Included will be a sample of virtual reality technology that has been shown to enhance understanding of molecular structures.

— Rachell Booth & Marvin Payne

Check the meetings page at asbmb.org and upcoming issues of ASBMB Today for more details and highlights of the annual meeting. We look forward to seeing you in San Diego.

The end of DACA? Just another hurdle

By Arianna Celis Luna

When the going gets tough, the tough get going. My college cross-country coach would yell this phrase during practice, and I would repeat it to myself during races when the obstacles (hills, hurdles, fatigue) seemed insurmountable and the finish line unreachable. I have applied this mentality of resilience to all aspects of my life. When I think about reaching my dreams and helping others reach theirs, higher education is the race I run. I must surpass all its obstacles and reach the finish line.

The importance of obtaining a higher education was ingrained in me at a young age. My parents immigrated to this country from Mexico and sacrificed everything so that my sisters and I could have the best opportunities for our education, our careers and our future. The course I have chosen in science and the knowledge I have gained enable me to turn my drives, efforts and dreams and my parents' sacrifice into something that will have a positive impact on the lives of others.

I am a fifth-year Ph.D. candidate. Graduation is on the horizon, and my family and I are getting ready to celebrate a longed-for achievement. It is an exciting time, but also a stressful one, as any Ph.D. recipient knows. During this last year, I get to juggle experiments, writing a thesis, looking for postdoctoral opportunities and applying for postdoctoral fellowships. This is when our time management, productivity and multitasking skills are put to the test. For those willing to pay this price, achieving the American dream is the reward. With the end of the Deferred Action for Childhood Arrivals program, however, I am reminded that my ability to strive for the American dream is not my right; it is provisional and can be taken away from me at any time.

When I think about reaching my dreams and helping others reach theirs, higher education is the race I run. I must surpass all its obstacles and reach the finish line.

Being an undocumented student in this country has placed many hurdles in my path. At a young age, I knew that I wanted to become a pediatrician. As a Spanish speaker, I thought I could care for children in the Hispanic community in the best way possible by correctly identifying their needs and being a comfort to the parents, whom I would inform properly and accurately. By the time I was ready to graduate from high school, I had done everything to get into college. I was accepted at prestigious schools, such as UCLA and the University of California, Berkeley, and applied for every scholarship. However, unlike my equally qualified peers, my admission into these universities and academic excellence did not dictate whether I could attend. As an undocumented student, I was ineligible for financial aid. Unable to afford tuition, I did not spend my next fall semester at any of these universities. This left a deep wound in my heart and also my mom's. I heard her quietly crying at night.

Determined not to give up on my dream of becoming a doctor, I enrolled at a community college. I joined the cross-country team and became enamored of the sport. In running, my efforts in practice were validated and rewarded in competition. My coach believed in me and saw my potential in the sport and in academics. With my coach's help, I earned a running scholarship to California State University, Bakersfield. It did not reach the academic standards I wanted for myself, nor was it the college of my dreams. However, this was my chance to continue my education, and I jumped at the opportunity. Able now to pay for tuition, I spent the next two years as a student-athlete. I became attracted to understanding the biochemical pathways that affect disease. I earned my B.S. in biochemistry, and this is how I jumped over the first hurdle.

At the end of my undergraduate career, I felt accomplished and was ready for the next step. I was ready for medical school, or so I thought. The reality that my options were strictly limited was quickly brought to my attention; without U.S. citizenship or a visa status, for which I was ineligible, I could not apply to medical school or even take the MCAT. Not giving up on my dream, I thought graduate school would be a good alternative. My lack of legal work authorization, however, also barred me from a Ph.D. program.

COURTESY OF ARIANNA CELIS LUNA

Arianna Celis Luna is flanked by her parents, Josefina Luna and Felix Celis, after receiving her B.S. from California State University, Bakersfield.

Constantly being denied access to an education and ability to contribute to society as I wanted was disheartening. With my parents' sacrifices and my younger sisters in mind, I found one last option. Upon graduation, I enrolled in a master's program at California State University, Los Angeles.

The world of research was rewarding. I worked on a biochemical pathway that affects a type of breast cancer that is resistant to chemotherapy. I learned that I could satisfy my desire to help people by understanding biochemical pathways that cause disease and figuring out how to target them. During this time, I also helped other undocumented students obtain a bachelor's degree. As president of Students United to Reach Goals in Education, a student-founded and student-run school organization for undocumented students, I organized fundraisers for scholarships for these students. More importantly, I showed them that they too could continue their education and go to graduate school. It was possible. This is how I jumped the second hurtle.

Just as I completed my master's degree, DACA went into effect. DACA provided legal work authorization to undocumented people who immigrated to this country as children and met certain criteria. With legal authorization to work, I pursued a Ph.D. in biochemistry at Montana State University, studying an enzymatic pathway unique to pathogenic Gram-positive bacteria. Working in this field reminds me of my competitive running days. You have to work hard to stay ahead, but all that effort and dedication is validated and rewarded. My growth from a chemistry student into a scientist has allowed me to see that research is my real calling and how I will have an influence in the world. My mentors and the communities that have helped me throughout my academic career inspire me to generate the same impact. Except, I now anticipate doing so as a researcher rather than a pediatrician.

Less than a year from graduation, another hurdle has been placed in my way. With the end of DACA and an expiration date set on my work permit, my future career suddenly is clouded and uncertain. I am saddened and afraid to be in this position again. At the same time, I am reminded that this hurdle is just that — another hurdle. Surrounded by people who believe in me, and always keeping my parents' sacrifice in mind, I'm not sure how I will reach my goal, but I am sure that I will.

Arianna Celis Luna (arianna.celis@montana.edu) is a fifth-year Ph.D. student in the chemistry and biochemistry department at Montana State University in Bozeman.

Do you see what I see?

Regional workshops to assess biomolecular visual literacy

By Henry Jakubowski, Margaret Franzen & Daniel Dries

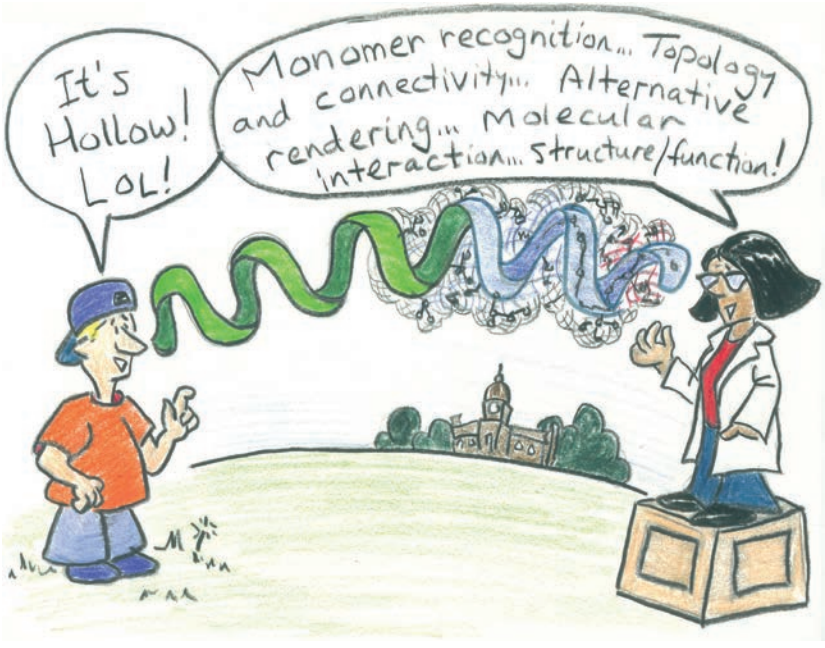
Bioscience textbooks contain an enormous number of figures representing structures, pathways, mechanisms and interactions. Educators tacitly assume that these representations illuminate student understanding of complex ideas, but we may not make explicit the learning goals and objectives upon which assessment of visual literacy is based.

Work has begun to develop explicit standards and assessments for visual literacy for metabolic pathway maps (1). With the help of a National Science Foundation Improving Undergraduate STEM Education grant, the open BioMolViz group (BioMolViz.org) has been developing competencies and assessment questions that target 12 overarching themes and associated learning goals and objectives based on a biomolecular visualization framework (2).

Without understanding structure, can students understand the biosciences and stay in the field? Textbooks show 2-D images of complicated 3-D structures. Textbook websites and others such as Protopedia offer animations and interactive molecular models. Some faculty have students manipulate structures using visualization software like Pymol and Chimera, create Jsmol tutorials and even print 3-D models.

Yet all this activity prompts these questions: Are students gaining insight into the fundamentals of structure-function relationships, or are they just algorithmically and passively observing colorful displays without acquiring the literacy we faculty assume? Do they know the learning goals of the faculty, who may not have made these goals explicit? Can we expect students to hold visual imagery, symbolic representations and existing conceptual understandings simultaneously as they build new ones?

Biochemistry educators have deemed biomolecular visualization a threshold concept (3), implying that students struggle with it. Ask anyone who has graded exams about the difficulty of such a cognitive synthesis.



COURTESY OF CHRIS SCHALLER, COLLEGE OF ST. BENEDICT/ST. JOHN'S UNIVERSITY

Workshop schedule

Jan. 20: Georgia Institute of Technology, Atlanta
Feb. 24: Washington University, St. Louis
March 10: Morgan State University, Baltimore
April 20: University of San Diego, San Diego

The BioMolViz group

Diane Dean, University of Saint Joseph
Daniel Dries, Juniata College
Margaret Franzen, Milwaukee School of Engineering
Henry Jakubowski, St. Benedict/St. John's University
Wally Novak, Wabash College
Kristen Procko, University of Saint Joseph
Alberto Roca, DiverseScholar.org, MinorityPostdoc.org
Cassidy Terrell, University of Minnesota Rochester

Misconceptions abound. Protein alpha helices are not filled with water. Molecules are not static. Most polar uncharged amino acid side chains are not on the surface of a protein. A mutation does not change the structure of double-stranded DNA. Nucleic acids do form secondary and tertiary structures.

The BioMolViz group, along with Paul Craig of the Rochester Institute of Technology and Laura Listenberger of St. Olaf College, has developed the present incarnation of the biomolecular visualization framework (2). But as an African proverb states, "If you want to go fast, go alone. If you want to go far, go together." To that end, and with the help of the NSF, we will hold four regional Saturday workshops to bring together faculty and postdocs to address biomolecular visualization literacy. Specifically, we will develop and vet competencies (the final skills and knowledge expected after a course of study) and some assessment questions targeting specific learning goals for four overarching themes: alternative renderings, molecular interactions, monomer recognition and topology/connectivity. Grant funds will help cover registration, food, transportation and accommodations for those traveling longer distances.

We hope to build a community of educators who understand the need for and gains from clear competencies and assessment tools to promote biomolecular visualization literacy. Look for targeted advertisements in ASBMB Today and in Biochemistry and Molecular Biology Education. We invite you to join us in this metacognitive adventure. For more information and an application form, please email the group at info@BioMolViz.org.

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Henry Jakubowski (hjakubowski@csbsju.edu) is a professor of chemistry at the College of St. Benedict/St. John's University, Minnesota.

Margaret Franzen (franzen@msoe.edu) is program director at the Milwaukee School of Engineering Center for BioMolecular Modeling.

Daniel Dries (dries@juniata.edu) is an assistant professor of chemistry at Juniata College, Pennsylvania.

Accreditation update: 68 and counting

By Peter J. Kennelly

During the past year, the American Society for Biochemistry and Molecular Biology's accreditation program for baccalaureate degrees in biochemistry and molecular biology has continued to grow and has worked to improve its quality and impact. Since our last update appeared in the October 2016 issue of ASBMB Today, the number of accredited schools has grown to 68, an increase of 14. The list of accredited schools includes colleges and universities of all types and sizes, ranging from large research-intensive universities to masters-granting programs to primarily undergraduate institutions, distributed across 29 states.

History and revisions

The accreditation program was conceived, developed and implemented by and for biochemists and molecular biologists. Now in its fourth year, the program's overarching objective is to recognize and promote excellence in undergraduate BMB education. The ASBMB's annual certification examination offers participating students the opportunity to earn a nationally recognized, outcomes-based credential that is independent of institutional cachet. The exam also provides accredited programs with a source of independently generated student performance data for making knowledge-based assessments of curriculum and pedagogy.

In early 2017, a subgroup of the graduation team (Joseph Provost, John Tansey, Debra Martin, Diane Dean, Michael Carastro, Adele Wolfson and Peter Kennelly) surveyed school officials, industry representatives and graduates of accredited programs on several subjects, including the application process. In response to this feedback, the process was reviewed and revised to make the instructions clearer and more straightforward, as well as to reduce the volume of supporting information required. The complete results of this survey soon will be submitted for publication.

Benefits of accreditation

"The support of this program from both pedagogical and assessment perspectives has been instrumental in allowing us to build a dynamic and research-based BMB curriculum that prepares our students for futures in STEM careers."

— Michael J. Wolyniak
Hampden-Sydney College

"Accreditation adds perceived value to our degree for some students and can be useful as a recruiting tool."

— Joseph Ogas
Purdue University

"The biggest benefit of accreditation for us has been that we now have a set of guidelines, and accountability, around which to structure and restructure our degree to serve our students in a more practical way."

— Teaster Baird Junior
San Francisco State University

"Program accreditation allows our students to take the ASBMB accreditation exam and gauge themselves to BMB peers nationally. Several of our graduates have successfully completed the exam and have been highly sought after for graduate school and/or industry positions."

— Michael G. Borland
Bloomsburg University of Pennsylvania

Exam 2017

This year, more than 650 students from 51 accredited programs took the ASBMB's 2017 certification examination. More than half of the participating students (approximately 55 percent) exhibited the breadth of knowledge and the depth of critical thinking necessary to qualify for ASBMB certification of their degrees, including approximately 18 percent who were certified with distinction.

One of our major goals for 2017 was to enhance the process and

Institutions with ASBMB accreditation

Berry College*
Bloomsburg University of Pennsylvania
Boston University
Brigham Young University
California State University - Long Beach
Colby College
East Stroudsburg State University
Georgia Gwinnett College*
Goucher College
Hampden-Sydney College
Hendrix College
Hope College
Hunter College of the City University of New York
Miami University
Middle Tennessee State University
Minnesota State University - Mankato
North Dakota State University
Northeastern University
Oklahoma State University
Oregon State University**
Otterbein University
Pennsylvania State University
Presbyterian College
Providence College*
Purdue University
Rhodes College*
Roanoke College
Rowan University
Saint Cloud State University*
Saint Mary's University of Minnesota
San Francisco State University
Shepherd University*
Smith College*
South Dakota State University
St. John's University
St. Mary's College of Maryland
Stockton University
Texas A&M University
Texas State University - San Marcos
Texas Tech University
Texas Wesleyan University*
The College of St. Scholastica
Towson University*
Tulane University
Union College
University of Arizona
University of California - Davis
University of Minnesota - Twin Cities
University of Montana
University of Nebraska - Lincoln
University of Nevada – Reno*
University of New Mexico
University of Richmond*
University of Saint Joseph
University of San Diego*
University of Southern Mississippi
University of St. Thomas
University of Tampa
University of the Sciences in Philadelphia
University of Virginia
University of Wisconsin - La Crosse*
Villanova University
Virginia Tech
Viterbo University*
Wayne State University
Wellesley College
Willamette University
Winthrop University

*newly accredited in 2017
** received accreditation for a second degree program

increase the output by which new questions are developed for the certification exam. As a consequence, a question-writing workshop organized by Victoria Moore and Daniel Dries was held as part of the ASBMB special symposium Transforming Undergraduate Education in the Molecular Life Sciences in July at the University of Tampa. At this workshop, more than 30 volunteers worked together to develop new questions as well as to learn about the features that characterize questions compatible with the format, scoring and objectives of the certification exam.

Why not join us?

The ASBMB accreditation program was created by and relies upon the contributions of scores of volunteers from the biochemistry and molecular biology community. Words cannot adequately express our gratitude to the many volunteers that animate the ASBMB accreditation program. These volunteers are not only vital to the program's growth and success — they shape its future direction. To get involved, contact Allison Goldberg at education@asbmb.org.

Peter J. Kennelly (pjkennel@vt.edu) is a professor of biochemistry at Virginia Tech.

Q&A with the ORI's Kathy Partin

By Kaoru Sakabe

Throughout this series, I hope I have conveyed the importance of performing your due diligence when it comes to data presentation. For my final column, I asked Kathy Partin, director of the Office of Research Integrity, or ORI, to share her thoughts on questions you may have had while reading the series. For those not familiar with the ORI, this government agency oversees and directs U.S. Public Health Service research integrity activities. Partin, who joined the ORI in December 2015, will be detailed to the Uniformed Services University of the Health Sciences in early December. Her responses have been edited for length and style; the full responses may be found online at asbmb.org/asbmbtoday.

What are questionable research practices? Is there a way to easily spot these? How should these be handled by individuals?

Questionable research practices, or QRPs, are those that fail to conform to well-accepted best practices and lead to lack of rigor and reproducibility but do not rise to the level of data falsification and/or fabrication. Examples could include the use of inappropriate controls, neglecting negative outcomes or using inappropriate statistics to support a hypothesis. These practices are not necessarily easy to spot, but they tend to be obvious with appropriate oversight, such as when one regularly compares raw data to analyzed data. Many believe that a nonrigorous laboratory culture can lead to a slippery slope

that will allow trainees to more readily make decisions about data acquisition or publications that could include misconduct. When lab members see questionable research practices, it is important to consider whether the training missed critical elements and to assess if there is adequate supervision. On the other hand, if a trainee continues to engage in questionable practices, despite good training, it might be appropriate for lab members to scrutinize the data for possible misconduct.

What are your recommendations to students/postdocs if they believe they are witnessing research misconduct?

Each of us plays a role in setting the ethical climate of the research environment, and with that comes the responsibility of taking appropriate action. If you see something, say something. However, it is important to understand that saying something sometimes puts the complainant at risk. Sometimes the complainant believes there is misconduct when there is not. Ideally, trainees have a trusted mentor to help think through potential explanations for what is being observed. A mentor can be sure a trainee understands the implications of alleging misconduct, particularly against his or her research advisor.

If someone suspects misconduct and doesn't have anyone to talk to, there are options to consider. Read the institution's research misconduct policy. Consider contacting the institution's research integrity officer or the ORI with questions or hypothetical scenarios. Many institutions use anonymous hotlines. It is generally wise to avoid direct confrontation with the person, such as accusing him or her. It is a good idea to document details related to the possible misconduct. The time may come to make an official allegation, and then consulting with the research integrity officer is essential.

How should mentors handle suspected research misconduct in their laboratory or department?

Mentors might think that they have an obligation to investigate at the first inkling of a problem. Not true. It is better to take even early concerns to the research integrity officer so any steps taken will comply with regulations and ensure a fair process. Often, allegations can be handled more efficiently and even dispelled when the integrity officer is consulted early. Documenting concerns, including information about hard drives, file names, notebooks, dates and locations, is very helpful. Mentors who investigate outside the institutional process risk unnecessary disclosure of allegations. Confidentiality is critical to protect both the

complainant and the accused. It is everyone's responsibility to ensure the integrity of research, but we must also protect others from being unfairly identified as performing misconduct. The key is to take action but discuss your concerns only with the appropriate institutional officials, such as the dean or research integrity officer.

What can mentors do to prevent questionable research practices or research misconduct in their laboratory?

Effective mentoring is key. In any mentor-mentee relationship, mentors accept responsibility for ensuring that their mentee is adequately trained and supervised. A critical responsibility of a good supervisor is effective communication before, during and after experiments are performed. Good supervisors are respectful of their trainees, supportive, available, prepared and honest. Supervisors need to be sure that they properly instruct on research methods, convey responsible research practices, foster intellectual development and routinely check that the trainee is following through with what has been taught. A good mentor-mentee relationship creates an invisible safety net for the entire research group.

Certain terms are often heard, such as research misconduct, ethics violations, unethical behavior and fraud. Can you elaborate on the differences? Are there differences in how an institution may handle these versus the ORI?

There is definitely some confusion about terms. From the federal government's perspective, there is only one definition of research misconduct: "fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results." Institutions may have a much broader definition and might include terms like "serious deviation from accepted policies," misappropriation, misrepresentation, etc. An institution may make a finding of misconduct based on its broader definition, and the ORI will not because we are statutorily required to use a narrower definition. Globally, other countries and institutions also have widely varying definitions of research misconduct. Private foundations or sponsors of research might have their own terms that govern what an institution must do if research misconduct is alleged.

COURTESY OF KATHY PARTIN

Kathy Partin is director of the Office of Research Integrity, the government agency that oversees and directs U.S. Public Health Service research integrity activities.

Are there agencies like the ORI in other countries? Does their definition of research misconduct differ from the ORI's?

Yes, there are regulatory agencies in Europe, Asia, Africa and North and South America that govern how research misconduct is adjudicated. Not only do definitions of misconduct vary, but the processes that govern the handling of allegations also vary widely. Recently, countries have been forming networks of research integrity officers to share best practices and novel approaches and also to begin to think about how to harmonize some of the practices. The ORI collaborates and communicates with such associations as much as possible.

How does our current incentive system play a role in research misconduct or QRPs?

There are those who believe that the competitive nature of funding and publishing decisions forces perverse incentives for success. Ultimately, good research requires rigor and integrity. Trainees who are going to be successful, productive scientists and who are resilient in the face of challenges must understand that the foundation of success in research is research integrity. Trainees must believe that quality of research, not quantity, is what is needed for a successful career. Quality research comes from places that value research integrity; trainees should think about the climate of the lab they might select as well as the quality of the research being done.

Interested in getting advice from Kaoru?

Kaoru and other JBC staff will be providing advice and answering questions in webinars about scientific writing and publishing. To sign up to receive information about upcoming webinars, visit https://asbmb.realmagnet.land/JBCwebinars.

Kaoru Sakabe (ksakabe@asbmb.org) is the data integrity manager at the ASBMB.

Getting creative with the IQ test

By Jeffrey H. Toney

Is creativity like a muscle, becoming more nimble and stronger with increasingly demanding workouts? We celebrate creativity of all kinds. Artists. Musicians. Architects. Scientists. Poets. Writers. We can't teach creativity. After all, everyone is creative. We just need to be inspired by the world around us. It's in human nature, right? I've been thinking a lot about this as the decades go by, worried that somehow that spark in me will fade away, like the red-hot matchhead that flickers just before extinguishing, its gray smoke marking its impermanence. One of my earliest memories of being creative was the dreaded IQ test in first grade.

An IQ test can be annoying or terrifying. It can crush a young boy's dreams. At six years of age in the mid-1960s, I was escorted to a small, windowless, white cinderblock room with uncomfortable bright blue plastic chairs and a tiny desk. My mom told me that they would be testing how smart I was, and I was terrified that somehow I would mess this up and be labeled stupid for the rest of my life. I timidly looked at the teacher as she opened a cardboard box with a picture of a castle on the lid and dumped the contents onto my desk.

"OK, Jeffrey," she said. "Take your time. Put the puzzle together. I'll be waiting outside."

My heart pounded as I heard her click the timer in her hand. She didn't say how long I had.

Once I began digging into the pile, I calmed down as the pieces easily fit together, simple tongue-in-groove

COURTESY OF JEFFREY H. TONEY

This photo of the author was taken when he was in first or second grade, about the time he took the IQ test.

shapes. I began to pick up momentum, my thumb confidently pressing down with a satisfying dull pop as the puzzle expanded. Yes! I would show them that I was smart. I knew how to do puzzles, all right. I knew it was done when I had assembled a perfect rectangle. Except …

"I'm done!" I proclaimed loudly.

My teacher quickly opened the door and clicked her timer, smiling at me.

"Good … job." Her smile quickly faded as she looked down.

"Thank you, Jeffrey."

"How'd I do?" I inquired.

"We'll let you know."

A few days later, my mom received a call from the school about my results. I thought they were going to send the results in the mail, like they did with my grades. I knew I'd messed up, because my mom was in tears.

"Do you remember the IQ test, the puzzle?"

"Yes."

"They said that you did it upside down. That's impossible. How could you solve the puzzle without the pictures?"

I was stunned. It wasn't my fault. The teacher dumped the pieces on my desk that way. How was I supposed to know I was allowed to turn them over? I thought that was the test. Besides, it was easy fitting the shapes together. I didn't need pictures. I wasn't a baby. Could I ask for a do-over? Please?

"It was easy, Mom. I just fit them together."

At first, my school was going to put me in a special class for children with disabilities. But after my mom spoke with the principal and explained what I had done, everything changed. Suddenly, I was put in a class with so-called smart kids.

I never did hear what my IQ score was, but I'm glad I had a chance to work on that puzzle, even if I was scared. I've been working on puzzles all my life, and they always frustrate me and delight me at the same time. And I'm grateful that they don't have pictures on the front, because that would make life just plain boring.

Jeffrey H. Toney (jetoney@kean.edu), a biochemist, has published scientific peer-reviewed articles and news media opinion pieces as well as short fiction stories for which he twice has been nominated for the Pushcart Prize. He serves as provost and vice president for academic affairs at Kean University.

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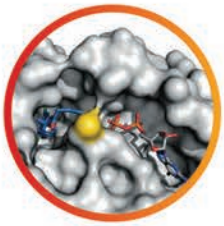

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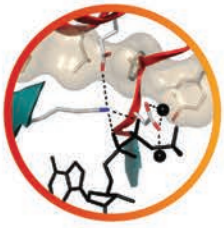

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