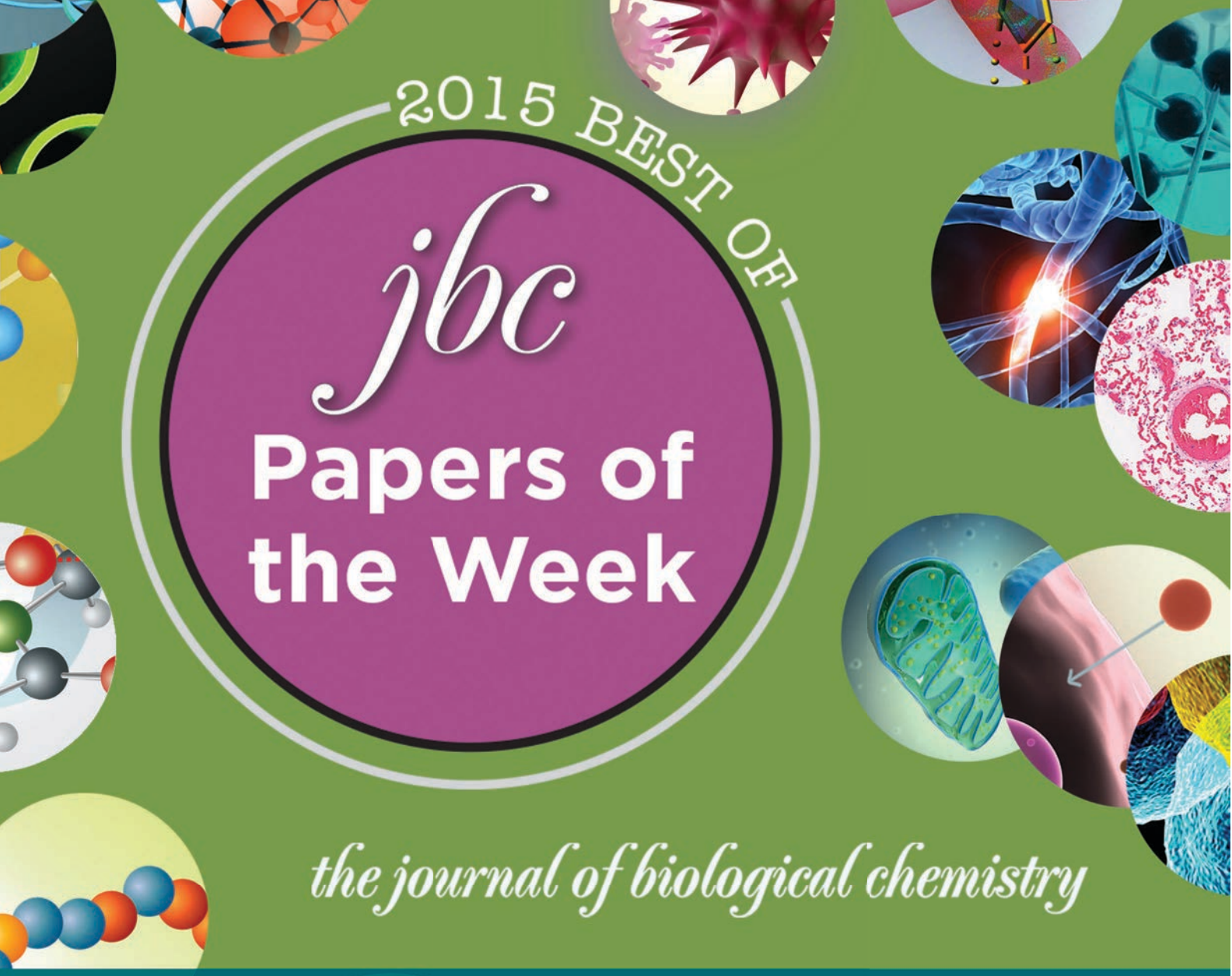
Vol. 15 / No. 2 / February 2016

ASBMB TODAY

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

DIVERSITY & INCLUSION MATTERS



Access the complimentary collection

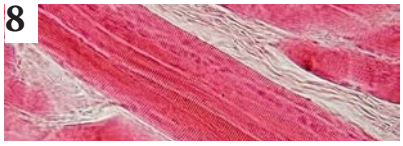
This year the editors made their selections from the JBC's Papers of the Week, which represent the top 2 percent of JBC papers in terms of overall importance.

Download the papers at
WWW.JBC.ORG

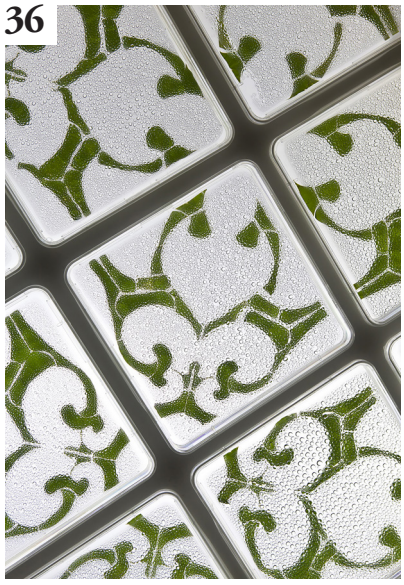
ASBMB
American Society for Biochemistry and Molecular Biology

CONTENTS

NEWS



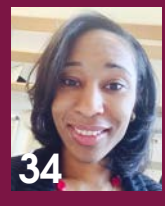
FEATURES



PERSPECTIVES

SPECIAL SECTION

24
YOUR VOICES ON
DIVERSITY & INCLUSION MATTERS



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

ASBMB
American Society for Biochemistry and Molecular Biology
www.asbmb.org/asbmbtoday
PRINT ISSN 2372-0409

Talking inclusion and diversity

Poet and activist Audre Lorde said, "In our work and in our living, we must recognize that difference is a reason for celebration and growth." She also said, "It is not our differences that divide us. It is our inability to recognize, accept and celebrate those differences."

Lorde, who was black, a lesbian, and briefly an academic, came of age half a century ago, long before offices for diversity and inclusion at academic institutions were commonplace. Her words still ring with currency.

We've come to learn that Lorde was right. Difference engenders growth in our work. When we recognize, accept and celebrate differences in our labs, classrooms and workplaces, we do better. Diverse teams are demonstrably better at identifying solutions, diversifying research foci and keeping in check biases that can undercut progress on projects.

Just as they did in the 1960s and '70s, students nationwide again are organizing and demonstrating — demanding that faculty and administrators do and be better on issues of diversity and inclusion. In December, researchers evaluated 30 years of National Institutes of Health grants and determined that white scientists' grant applications continue to get funded at higher rates than minority scientists'. Head over to Twitter, and you will quickly see that historically marginalized students and researchers continue to contend with othering on a daily basis.

Last month, we asked our readers to weigh in on the current state of diversity and inclusion in biochemistry and molecular biology. Did they think that BMB embraced or discouraged diverse voices and experiences? From their perches, were women and underrepresented minorities given seats at most tables? How did having people of color, women, LBGT and differently-abled individuals at the bench or in the classroom enrich scientific perspectives? Boy, they had a lot to say. We've printed their responses in a special section in this issue.

They told us many things. Among them, that although scientists say they want full equality, they don't do what's necessary to achieve it. That the push to stabilize funding for investigators near retirement and for well-established groups likely comes at the expense of the diverse junior and mid-career investigators. And that institutions can recruit colleagues from all walks of life but it won't make a bit of difference if they don't also retain and support that talent.

We see these responses as the first part of an ongoing discussion about diversity and inclusion matters in BMB. This first part is about where the field currently is in regard to these issues and how people honestly are feeling about it. Later, we'll ask our members and readers another set of questions. How can the field improve? What are the real, concrete steps? Where are the promising developments?

If you teach, do any hiring, evaluate grants, nominate people for awards, plan meeting symposia, select speakers, invite review authors and influence institutional culture, we hope you'll consider participating in this conversation or at least tuning in to hear what your colleagues have to say.

Lauren Dockett and Angela Hopp

Diversity rules

By Steven McKnight

Over the past several decades, I have worked with my colleagues in the biochemistry department at the University of Texas Southwestern Medical Center at Dallas to build what has evolved into a unique scientific environment. From the start, we collectively decided that what we needed was diversity of scientific capability.

Our objective was to build a department that could use almost any tool necessary to probe biological systems. We recognized the need for expertise in structural biology, synthetic chemistry, natural products chemistry, high-throughput screening and its associated robotics and informatics, hardcore biochemistry, small animal pharmacology, and the use of model organisms for the study of new and complex problems in biology.

We did not need capabilities in the field of molecular biology: Those were already represented in spades across the UTSWMC campus. For the same reason, we did not need expertise in genetics, genomics or clinical research.

What we needed to build a bona fide department of biochemistry were diverse capabilities not, at that time, represented at our school.

I emphasize here the importance of diversity in research. I liken the different strengths in our biochemistry department to those of a football team. A team that has big, strong offensive and defensive linemen, fleet receivers and defensive backs, good punters and field goal kickers, and a good quarterback will beat a team fielding 11 star quarterbacks hands down. By having chemists, biophysicists, biologists, pharmacologists and biochemists, our department — with the help of disciplinary capabilities covered elsewhere at our institution — can approach just about any problem in biomedical research.

The historical image of a successful academic scientist is a white male wearing a bow tie and tweed jacket adorned with leather elbow patches.

With respect to competitiveness, of course, diversity is not limited to the variety of scientific disciplines. We need scientists ranging in age from our young summer interns to the oldest member of our faculty, Kosaku Uyeda, about whom I'll have more to say below. We need both women and men as critical contributors, and we need ethnic diversity.

Longer term, what we have been trying to build will not last without representational diversity. Hard problems are far better approached by teams blessed with diversity. When I say hard problems, I refer to challenges that are not guided by any instructional formula or map. The collective knowledge of a team, if homogeneous, is little better than that of a single member of the team.

The historical image of a successful academic scientist is a white male wearing a bow tie and tweed jacket adorned with leather elbow patches. This person is awash with grant funds, runs a large, self-contained laboratory and travels the world giving lectures and winning awards. Historically, promotion committees have wanted to see this image before granting tenure to a faculty member. Whereas this image of academic science may persist to some degree, it is thankfully on the way out. If not, the enterprise of biomedical research in America would wither and die. Any department filled with faculty of this description is as likely to dominate science in the future as a football team that hits the field with 11 quarterbacks.

I'll close with a few words about Kosaku Uyeda, the sage of our biochemistry department. Ko was trained as a biochemist at the University of Oregon and at the University of California, Berkeley, in the late 1950s and early 1960s. Throughout his career, he has made textbook discoveries telling us how cells regulate their physiology as a function of access, or lack thereof, to glucose. Ko knows more about intermediary metabolism than the rest of the entire UTSWMC campus in aggregate.

Research in fundamental metabolism went to bed for 30 years. Now that the gold rush of molecular biology and genomics is coming to an end, if we want to do anything more than mindless data gathering, we are challenged to return to thinking about problems that require acumen beyond the four letters of the genetic code.

Seeing the very youngest of our trainees rub shoulders and gain sagacity from our oldest faculty member gives me a huge boost of confidence that what we are building may persist. Diversity rules!

Steven McKnight (steven.mcknight@utsouthwestern.edu) is president of the American Society for Biochemistry and Molecular Biology and chairman of the biochemistry department at the University of Texas-Southwestern Medical Center at Dallas.

Not your standard advocacy

By Chris Pickett

"Send a letter to your member of Congress NOW!" "Come to Washington, D.C., to meet with your legislators!"

You've probably seen these and similar emails from the Office of Public Affairs at the American Society for Biochemistry and Molecular Biology. We encourage you to send letters, make phone calls and conduct meetings to influence how legislators vote. But methods for advocating are constantly changing, and we are always looking for new ways to amplify the voices of scientists.

Recently we sponsored a Hack Day to help postdoctoral scholars advocate on behalf of their community. A Hack Day, or hack-a-thon, engages people to work in a short timeframe to solve a well-defined set of problems. For this Hack Day, the ASBMB partnered with Future of Research, a group of postdoc activists working to improve the postdoc experience who were recently named the 2015 Science Careers People of the Year.

The ASBMB/FOR Hack Day took place at the 2015 Boston FOR symposium. It lasted 14 hours and challenged attendees either to hone methods of collecting data about postdoc careers or to devise ways to improve the presentation of this information. Five groups, ranging from three to seven members, participated in the event. Three independent judges evaluated the groups' submissions, and two winners were chosen (see box).

Among other issues, the postdocs who attended the Hack Day were advocating for better pay and benefits and improved data collection on postdoc career opportunities. The targets of this advocacy are universities and federal science-funding agencies like the National Science Foundation and the National Institutes of Health. Ultimately, the Hack Day projects created new tools to help postdocs strengthen their arguments when communicating with policymakers at these and similar institutions.

Another tool that is improving direct advocacy efforts these days is Twitter. This microblogging site allows for rapid dissemination of messages, and most news outlets that publish breaking news publicize their stories on Twitter. Similarly, nearly every member of Congress has a Twitter account, as do most federal agencies including the NIH, the NSF, and the White House Office of Science and Technology Policy.

During ASBMB Capitol Hill Days, we encourage our participants to send tweets to the offices they've visited as a way to say thank you and to reinforce our message. This not only continues conversations begun during the meetings but allows those not present for our Hill Day to take part virtually. Growing the conversation in this manner is an important way to convey to policymakers the sheer number of scientists interested in specific topics.

Advocacy can take forms other than sending letters, making phone calls or conducting meetings. By analyzing new data and finding new stories to tell policymakers, we can be more effective advocates of the importance of research. And engaging these policymakers through nonconventional means like Twitter can both amplify our message and provide us more direct access to those who are writing the laws and regulations that will affect how research is done.

Winners of the ASBMB/Future of Research Hack Day

Winning project 1

Dana King, Kelley Kranjc, Steen Hoyer, Mayank Choudhary, Vasavi Sundaram, Shuxiang Ruan and Hemangi Chaudari: The project cross-referenced data from the National Science Foundation and Washington University in St. Louis to get a better grasp on career outcomes for Ph.D.s. This group also created a choose-your-own-adventure game. More information about the project can be found at bit.ly/1mYEprJ.

Winning project 2

Alberto Roca, Rebecca Lowdon and Erica Walsh: This project used data from the National Center for Science and Engineering Statistics to address the number of minority postdocs across the U.S. by combining data sets to determine the postdocs' geographic location. More information about the project can be found at bit.ly/1mRknzC.

Chris Pickett (cpickett@asbmb.org) is the policy analyst at the ASBMB. Follow his postings on the ASBMB Policy Blotter at policy.asbmb.org.

Lemmon named Sackler professor at Yale


LEMMON

Former American Society for Biochemistry and Molecular Biology secretary Mark Lemmon has been named the David A. Sackler professor of pharmacology at Yale University. His is one of three new professorships funded through the Richard Sackler Family Endowment in Medicine. Lemmon, who was chair of the department of biochemistry and biophysics at the University of Pennsylvania from 2008–2015, joined the faculty at Yale in June and also recently was named co-director of the Yale Cancer Biology Institute, which, when it opens, will bring together 120 researchers to examine the molecular causes of cancer and search for new targets. Lemmon received both his M.Phil. and his Ph.D. from Yale before completing a postdoc at the New York University Medical Center. He served for 19 years on the faculty at the University of Pennsylvania Perelman School of Medicine, where he was an investigator at the Abramson Family Cancer Research Institute and the George W. Raiziss professor of biochemistry and biophysics. Lemmon's research focuses on receptor tyrosine kinase signaling pathways and their effects on cell growth, which have implications for cancer research.

Written by Alexandra Taylor

Hobbs wins Pearl Meister Greengard Prize


HOBBS

Helen Hobbs, a professor of internal medicine and molecular genetics at the University of Texas Southwestern Medical Center at Dallas, won The Rockefeller University's Pearl Meister Greengard Prize.

The prize honors exceptional female scientists. Rachel Maddow, host of the Rachel Maddow Show on MSNBC, presented Hobbs with the award. Hobbs received the prize for her breakthrough research on the genetics of high cholesterol and heart disease. Her work has led to the development of new treatments for heart and liver disease and of cholesterol-lowering drugs that won U.S. Food and Drug Administration approval this summer.

Nobel laureate Paul Greengard donated the monetary share of his Nobel Prize to create the Pearl Meister Greengard Prize along with sculptor Ursula von Rydinsvard and others. When asked about her success during the award ceremony, Hobbs said, "Science is like surfing. Sometimes you're in whitewater, going nowhere, and nothing is working. Then suddenly, you catch a wave. Those are the moments you really hold on to."

Hobbs, who is an investigator at the Howard Hughes Medical Institute, recently also won the 2016 Breakthrough Prize in Life Sciences. She has been elected to the National Academy of Sciences, the American Academy of Arts and Sciences and the National Academy of Medicine.

Written by Jacqueline Lantsman

Charpentier, Fuchs and Eisenberg get Vallee Visiting Professorships

Three American Society for Biochemistry and Molecular Biology members — Emanuelle Charpentier of the Max Planck Institute, Elaine Fuchs of The Rockefeller University and David Eisenberg of the University of California, Los Angeles — won 2016 Vallee Visiting Professorships from the Vallee Foundation.

The Vallee Foundation supports senior scientists in taking time away from their labs and institutions to pursue research and build relationships with institutes anywhere in the world.


CHARPENTIER

Charpentier is director of the Max Planck Institute of Infection Biology in Berlin and, with her collaborator Jennifer Doudna, characterized the CRISPR-Cas 9 system, a bacterial defense mechanism that can cleave and edit foreign DNA.

Fuchs is the Rebecca Lancefield professor in mammalian cell biology and development at the Rockefeller University and a Howard Hughes Medical Institute investigator. She has done pivotal work on stem cells and is one of the first scientists to characterize a cancer stem cell. Her work on how skin stem cells communicate has led to clinically important discoveries for cancer, skin burns and wound repair.


FUCHS


EISENBERG

Eisenberg is the Paul D. Boyer professor of biochemistry and molecular biology at the University of California, Los Angeles, and an HHMI investigator. His research publications have been cited by 66,000 scholarly articles, and his work on the amyloid state of proteins has led to determining the structure of the toxic core of the alpha-synuclein protein, which is linked to Parkinson's disease.

Written by Jacqueline Lantsman

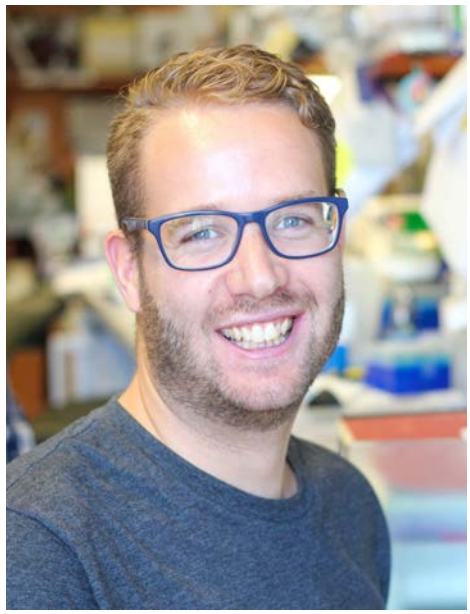
Van der Kant wins Tabor Award

By Erik Maradiaga

Rik Van der Kant, a researcher at the University of California, San Diego, received the Journal of Biological Chemistry Herb Tabor Young Investigator Award for his work on the biochemistry of early pathological changes in the neurons of Alzheimer's patients.

Van der Kant was born and raised in Deurne, a small town in the south of the Netherlands. He began his undergraduate work at Radboud University in Nijmegen, Netherlands, interested in both biology and ecology. After completing ecological/marine biology and biochemical internships, Van der Kant chose to focus on cell biology. He did his Ph.D. with Jacques Neefjes at the Netherlands Cancer Institute in Amsterdam, where he worked on the processes of endosomal transport and regulation by cholesterol and multiprotein complexes.

While with Neefjes, Van der Kant described the regulation of endosomal transport by the endoplasmic reticulum and explained how a multiprotein effector complex on late endosomes combines transport and fusion steps. The studies underscored the importance of these processes for cellular functions.

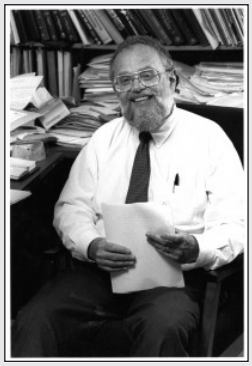


Rik Van der Kant received the Tabor award from JBC Associate Editor Paul Fraser of the University of Toronto in December at the Zing Neurodegeneration Conference in Cancun, Mexico.

Mutations in components of the pathways that Van der Kant studied are thought to underlie rare diseases such as the neurodegenerative Neimann–Pick type C and arthrogryposis renal dysfunction cholestasis syndrome. During Van der Kant's graduate work, these pathways were also being implicated in Alzheimer's disease. After earning his Ph.D., Van der Kant joined the lab of Larry Goldstein at UCSD with the intention to study the cell biology of Alzheimer's. Defective tau proteins are associated with Alzheimer's, and, in Goldstein's lab, Van der Kant has identified regulators of tau phosphorylation as part of a large drug screen. He will continue his work by studying neurons derived from induced pluripotent stem cells and hopes one day to contribute to a cure for Alzheimer's disease.

Erik Maradiaga (em39142@student.american.edu) is a biology major at American University.

IN MEMORIAM
William Firshein, 1930 – 2015



WESLEYAN UNIVERSITY SPECIAL COLLECTIONS & ARCHIVES

William Firshein, professor emeritus of biology at Wesleyan University, passed away in December at the age of 85. Firshein researched bacterial DNA and was an active scholar whose most recent book, "The Infectious Microbe," was published in 2014.

Firshein was born in 1930 in Brooklyn, New York. He became interested in science during his senior year of high school and was inspired to earn his bachelor's degree from Brooklyn College. Soon after completing a master's degree at Rutgers University, Firshein was drafted into the army and did a stint as a microbiology assistant studying anthrax at Fort Detrick in Maryland. After two years in the military, Firshein returned to Rutgers to earn his Ph.D. in the lab of Werner Braun. At the age of 28, he was hired by Wesleyan University, where he taught for 47 years before retiring in 2005.

Firshein was instrumental in establishing the molecular biology and biochemistry department at Wesleyan. An award given in his name each year recognizes student contributions to the department. He also helped to found Ph.D. programs in biochemistry and molecular biology. Firshein is survived by his wife and four sons.

Written by Alexandra Taylor

Fenugreek may improve diabetes treatment

By Natalie Wheeler

We hear it at the end of every drug commercial. Taking a particular medication will aid one problem while causing a whole slew of other issues. This is certainly true for the treatment of type 2 diabetes. Currently, glucagon-like peptide 1, or GLP-1, analogs are approved to treat type 2 diabetics and are undergoing clinical trials for other disorders including neurodegenerative diseases. But alongside their therapeutic properties, these analogs initiate a global activation of their target receptor, GLP-1R, and that activation ultimately leads to side effects that include nausea, vomiting and gastrointestinal distress.

In an attempt to avoid the adverse effects associated with current GLP-1 analog treatments, labs led by Rong-Jie Chein and Klim King, both of Academia Sinica in Taipei, Taiwan, sought to characterize molecules that set off the signaling pathway of GLP-1R without directly interacting with GLP-1R.

The researchers screened extracts from edible plants for these positive modulators and, in a recent issue of the **Journal of Biological Chemistry**, report finding a novel compound in fenugreek. According to Chein and King, the plant, cultivated worldwide as an herb, spice and vegetable and recommended to some breastfeeding mothers to stimulate milk production, contains a compound that binds to and enhances GLP-1 potency.

GLP-1 is a peptide hormone that enhances insulin secretion. GLP-1 binds the receptor GLP-1R, which is expressed in various tissues throughout the body, including but not limited to the lungs, heart, kidney, blood vessels, neurons and white blood cells. GLP-1 signaling has been an ideal candidate for drug discovery and development and is a target for many therapies including treatments for psoriasis, heart disease and neurodegenerative disorders.

Therapeutic treatment of type 2 diabetes aims to enhance activation of the GLP-1R receptor. The GLP-1 analogs that this strategy uses are maintained at a chronically high plasma level. It is an artificial, systemic approach that leads to the disrupted regulation of GLP-1R signaling, which — along with the aforementioned side effects — could ultimately lead to the development of pancreatitis and pancreatic malignancies. To be able to circumvent these adverse effects, a modulator that activates the receptor based purely on physiological needs has been sought.

In a previous investigation of GLP-1 regulation, Cheng and colleagues at Academia Sinica discovered that some endocannabinoids, like lipids, can positively modulate GLP-1R by enhancing the activity of GLP-1(1). They also established a feasible detection to screen such activity from plant extracts. These prior study results are what prompted the researchers to screen active compounds from edible herbs including fenugreek.

Using positive modulators of GLP-1R signaling differs from the current analog therapy, as the modulators themselves do not activate the GLP-1R. This allows for control over the degree of activation of these receptors and is less likely to lead to chronic activation of GLP-1R.

Fenugreek is cultivated worldwide and may enhance GLP-1 potency.

Using a combination of two assays, the paper's authors found the active compound N55 from fenugreek seeds that affected GLP-1R signaling. The first assay measured intracellular cyclic AMP levels — cAMP is needed for proper insulin secretion essential for treatment of type 2 diabetes. The second assay the investigators used looked at GLP-1R endocytosis, or the uptake of GLP-1R into the cell. Endocytosis of GLP-1R is a measure of receptor activation and stimulation of the cAMP pathway. Using these two assays, the investigators showed that N55 promoted GLP-1-dependent cAMP production and GLP-1R endocytosis. Unlike the current analogs, which bind GLP-1R and permanently turn on the receptor, N55 binds to GLP-1 and stimulates the cAMP pathway according to the physiological level of GLP-1. This leads to proper insulin release.

N55 is highlighted as the first compound of a new class of modulators that enhance GLP-1R signaling. Chein and King's research also outlines the concept that GLP-1 may be a novel target for type 2 diabetes and other conditions. Additionally, the screens used to detect N55 may be crucial for future plant compound discovery efforts related to other receptors and ligands. Future studies assessing the effects of N55 in vivo will be needed before its use as a therapeutic treatment.

Natalie Wheeler (allena@mymail.vuc.edu) is a neuroscience Ph.D. candidate in her final year at Virginia Commonwealth University.

REFERENCE

1. Cheng,Y.H., *et al. J. Biol. Chem.* **290**, 14302 – 14313 (2015).

A transcription cofactor that alters our muscle cells during exercise

By Caitlin Hanlon

Pick up almost any magazine at a grocery store, and chances are the benefits of exercise will be lauded on the cover. While the health, aesthetic and mental benefits of exercise often are discussed in the popular press, the cellular changes that happen to the muscle itself are glossed over. We know that exercise promotes changes in muscle as it adapts to an increased workload, and in a recent issue of the **Journal of Lipid Research**, researchers identified a transcription cofactor that links exercise to specific changes in muscle cell phospholipids.

Phospholipids surround our cells, providing structure and protection in the membranes. They consist of a hydrophilic head group and hydrophobic long chain hydrocarbon tails. Variations between head groups, hydrocarbon chain lengths and hydrocarbon saturation lead to many different subtypes of phospholipids. Each type of phospholipid lends different characteristics to the membrane it resides in. For example, some phospholipids promote membrane curvature or flexibility, while others are necessary to retain specific proteins. Previous work has demonstrated that a transcription cofactor known as PGC1α, or peroximsome proliferator-activity receptor γ coactivator 1α, is upregulated in response to exercise and that exercise alters muscle phospholipid composition. In their article, Nanami Senoo and others from the University of Shizuoka in Japan describe a study that investigated whether the exercise-induced changes in phospholipid composition of muscle are dependent upon PGC1α.

The authors began by examining mouse skeletal muscle as it overexpressed PGC1α. Two types of lower hind leg muscle were isolated from the mice — the extensor digitorum longus, or EDL, which is a glycolytic or fast-twitch muscle, and the soleus, an oxidative or slow-twitch muscle. The researchers extracted lipids from these muscles and analyzed them by type and amount via liquid chromatography/mass spectrometry analysis and thin-layer chromatography analysis. The authors noticed changes in the phospholipid composition in both muscle types. Specifically, they found that overexpression of PGC1α caused the fast-twitch EDL muscle to have a phospholipid profile that resembled the slow-twitch soleus. The authors then examined specifically which phospholipids were changing with PGC1α overexpression. In the EDL, many types of phosphatidylcholine, or PC, and phosphatidylethanolamine, or PE, two specific phospholipids found in the membrane, were upregulated, but one specific isoform (18:0/22:6) of both was quite significantly increased. They observed a similar change in the soleus, although the baseline levels of these phospholipids already were increased in this type of muscle.

The next step was to determine if these specific phospholipids increased in response to exercise. The researchers separated the mice into a sedentary group and a group that had access to an exercise wheel. Interestingly, in the EDL, exercise alone mimicked the effects of overexpression of PGC1α, as both types of phospholipids increased. The authors then asked the most intriguing question of the study: Are these changes caused by PGC1α? In mice that lacked PGC1α, the increases in PC (18:0/22:6) and PE (18:0/22:6) after exercise were completely absent.

This work is the first to show that exercise induces a change in muscle phospholipids via increased PGC1α activity. More broadly, this finding demonstrates that exercise itself causes fast-twitch muscles to adopt some characteristics of the more endurance-oriented slow-twitch muscles.

Because PGC1α is a nuclear receptor or transcription coactivator involved in regulating the transcriptional activity of genes, it is unlikely to affect the composition of membrane phospholipids directly due to its primary role in the nucleus. With this in mind, the authors tried to identify the pathways or enzymes that may be responsible for the changes in PC and PE. Although the expression of some enzymes that are involved early in the fatty acid synthesis pathway increased with PGC1α over-expression, the expression of enzymes that specifically make PC and PE did not. Therefore, the exact mechanism of how PGC1α is translating exercise into changes in cell membranes remains unknown.

Uncovering the pathways that govern PGC1α activity may have important therapeutic implications for diseases that affect muscle function, such as muscular dystrophy. In fact, PGC1α can lessen the effects of muscular dystrophy in mouse models, but it remains to be investigated if this improvement can be attributed to changes in muscle phospholipid composition.

Caitlin Hanlon (chanlon3@jhmi.edu) earned a B.S. from Ursinus College and a Ph.D. from the Department of Cell Biology at the Johns Hopkins School of Medicine.

The placenta: a mysterious organ

The Human Placenta Project aims to understand better what the placenta does, how it does it and what can make it fail

By Alexandra Pantos & Rajendrani Mukhopadhyay

In early winter 2005, Tara Shafer was pregnant with her second child. She was seven months along, her baby safely past the date when doctors assure parents that newborns will survive even if they are born early. Still, Shafer had grown concerned that her baby wasn't moving enough. She made an appointment with her obstetrician, trying to believe everything was fine. In retrospect, she says, a part of her knew something was very wrong.

Shafer remembers snow falling outside as her doctor broke the news that they couldn't find a heartbeat. The baby would have to come out. Shafer was afforded little time to process what was happening before labor was induced.

TARA SHAFER

Tara Shafer with her children, Reid (age 12), David (age 8) and Isabelle (age 5). David and Isabelle were born after Shafer received treatment for thrombosis.

Shafer's stillbirth resulted from a placental abruption caused by thrombosis, an undiagnosed blood-clotting disorder that hadn't presented in her first pregnancy. The loss of the baby, who was a boy, shattered Shafer. "Your life is never the same," she says. "No matter how many kids you go on to have, there's always a piece of you that is devastated by what happened. And you can't explain how isolating it can be."

A fetus lost after 24 weeks of pregnancy is considered a stillbirth. About 23,600 pregnancies end in stillbirth every year in the U.S. Miscarriages, defined as fetuses lost before 24 weeks, are thought to occur in 10 percent to 20 percent of pregnancies, though the real number is presumed to be higher since many miscarriages occur before a woman even knows she is pregnant. Researchers believe that problems with the placenta may be behind many of these pregnancy losses. But no one knows for sure.

The human placenta is a temporary organ. Over the course of a pregnancy, it establishes, in a coordinated fashion, critical structures that both protect and grow the fetus. Acting as every organ the fetus needs to survive — heart, lungs, gut, liver, even the endocrine system — the placenta provides all the nutrients, oxygen, water and other molecules necessary for fetal development. The placenta also fends off dangers from the mother, such as viral infections. Once the baby is born, the placenta's work is done, and it is discarded.

Despite being critical to a baby's survival, the placenta remains some-

thing of a medical mystery. Detailed understanding about how it carries out all its functions is lacking. Even less is known about what has gone awry with those functions when a pregnancy is lost.

The National Institutes of Health established the Human Placenta Project in 2014 to address this lack of knowledge. Researchers funded by the HPP are hoping to create new technologies that will help them investigate how the placenta comes to be, does its job and then closes shop. The project also aims to explore how some disorders, such as heart disease, may arise both for the mother and child later in life if the placenta doesn't function optimally during pregnancy. The ultimate goal of the HPP is to comprehend better how problems with the placenta may lead to conditions such as preeclampsia, gestational diabetes, fetal growth restriction and stillbirth.

"As clinical and academic as the placenta project seems to be on the face of it, if you dig deeper, it's incredibly exciting because they're looking at the reasons that pregnancies fail," says Shafer, who feels fortunate to have gotten a diagnosis for her loss. Shafer is a co-founder of Reconceiving Loss, an online resource for families coping with pregnancy and infant loss. "In looking at those reasons, they are looking to comfort and give answers to women who live decades wondering what happened."

Why the placenta matters

Even though every human being starts out as a fetus attached to a placenta, placental health often still is portrayed as a women's issue. The placenta does develop in the uterus but is considered by scientists to be a fetal organ. "It has the same background as the fetus," says George Saade at the University of Texas Medical Branch in Galveston. "It may be viewed as a foreign organ to the mother."

"I think it's really important that people in our community, our society and our government funding agencies understand that (placental health) is (a) really critical issue for human development," says Yoel Sadovsky, an HPP awardee at the University of Pittsburgh. "It's not just a women's health issue."

Typically weighing in at about a pound, a placenta is roughly the size of a small dinner plate. "The placenta is a really fascinating organ to see," says the HPP's director, David Weinberg, who is at the Eunice Kennedy Shriver National Institute of Child Health and Human Development. "It's round. It's sort of flat. It can be reddish, purplish in color. You can see veins along one surface."

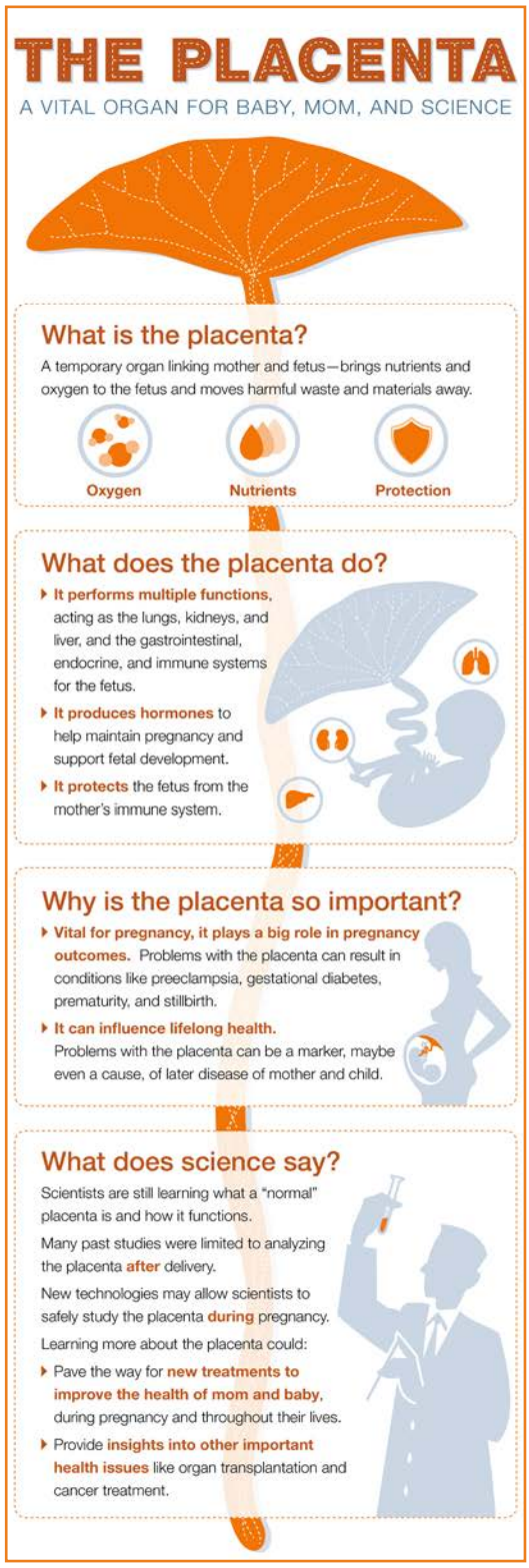
For its compact size, the placenta carries out a slew of activities. "I would describe it as the most complex, transient, vascular, endocrine, immune human organ that we know the least about," says Antonio Frias, an HPP awardee at Oregon Health and Science University. "I think it's amazing that maternal circulation and fetal circulation have to develop in parallel, while at the same time deal with the immunologic issues of a foreign object growing inside (the mother) and enormous endocrine functions to support both fetal growth and maintain maternal health."

Some of the HPP's aims

The HPP places much emphasis on the "human" part of its name because animal models are not as useful for studying the placenta as they are for some other organs. There are much greater similarities between mice and humans, explains Sadovsky, when looking at organs such as the heart or the liver than there are when looking at the placenta. Weinberg says that most of the information that we currently have "comes from studying the placenta after delivery, when the game is over."

With the $46 million that the HPP

CONTINUED ON PAGE 12



NATIONAL INSTITUTES OF HEALTH

NATIONAL INSTITUTES OF HEALTH

David Weinberg, director of the Human Placenta Project, examines a placenta in the lab.

CONTINUED FROM PAGE 11

distributed to researchers for the fiscal year 2015, the central effort of the project is to study the placenta while it does its job over the course of a pregnancy. Weinberg says the project hopes to "either develop completely novel technologies or develop novel applications of existing technologies."

The project will sponsor additional research in animal models if the investigators can present a path for eventual translation to humans.

Existing technologies for human research include ultrasound and magnetic resonance technologies that will help researchers observe more clearly and in greater detail how the placenta does its job without interfering with the organ. Frias says his group has been focused primarily on imaging in order to get "better real-time assessments of placental function." The investigators hope to be able to use these noninvasive tools to gain new understanding of both normal and abnormal placentas.

From a molecular angle, Sadovsky and colleagues discovered microRNAs that are unique to the placenta and may help protect against viral infections that might otherwise cross the placental barrier. However, this discovery was made while looking at cultures of placental cells. Though this new information is significant to placental research, Sadovsky is hoping to be able to look at these types of things in functioning placentas. He says they are also "trying to understand how nutrients are crossing the placenta in normal conditions as well as diseased conditions."

Connections are important to Alfred Abuhamad of Eastern Virginia Medical School. He is interested in learning more about one of the most important ways the fetus and the mother exchange materials: through blood vessels. Specifically, he says, his group wants to learn how fetal blood vessels form, "how they come together, and how they connect with the maternal blood vessels."

Investigators also are hoping to learn how the flow of blood between maternal and fetal blood vessels affects the exchange of materials and to connect that information to pregnancy outcome.

Abuhamad has a specific interest in calcium. "Calcium is the sign of aging tissue," he says, and by studying calcium levels in the first trimester, he and his colleagues hope to help determine if a placenta "has aged

before its time." If so, they may be able to determine that premature labor is correlated with the presence of higher levels of calcium early on in the pregnancy. Furthermore, the research could help unlock some of the answers to what causes other disorders, such as hypertension, which has been correlated with abnormally high levels of calcium.

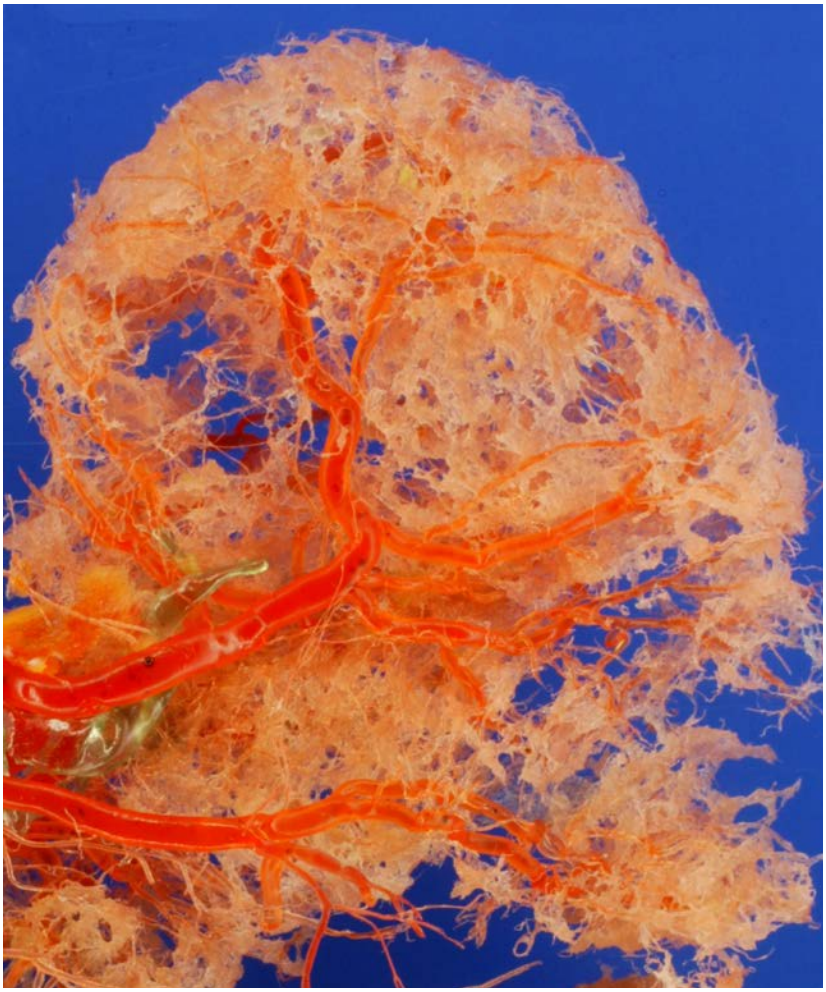
'We don't have enough information'

Weinberg says that the HPP grew out of a search by the leaders at the Eunice Kennedy Shriver National Institute of Child Health and Human Development for the "most promising scientific opportunities for the next decade." He and his colleagues asked for input on these opportunities from a variety of experts, and the experts repeatedly mentioned the placenta. Besides understanding how a normal placenta functions, the ultimate goal of the HPP is to learn how to avoid the problems that can arise with the placenta, including stillbirths like Shafer's. This isn't just about advancing science.

Early on in the project, Weinberg says he received a phone call from a woman who had lost a pregnancy. She was hoping to be able to donate her placenta and help in some way so that other parents wouldn't have to feel what she had felt.

"In that moment," Weinberg says, "it really drove home for me that we have an opportunity to do something really important now. If we understood placental development and function across pregnancy better, perhaps we could develop knowledge and insight in technology that would ultimately lead to better pregnancy outcomes and healthier lifelong outcomes for both the mom and child."

As someone who has gone public with her pain over her lost child, Shafer concurs. "We don't have enough information. We could have so much more with a coordinated, multipronged medical approach to understanding how (the placenta) develops and when it starts to fail," she says. "If there are things that could be addressed within that failure, then we could use that information to affect the lives of families in a very important way. For a really wanted baby, the loss is devastating. These babies haunt families."



NATIONAL INSTITUTES OF HEALTH

The chorionic villi of the placenta, shown here, are part of the border between maternal and fetal blood.

Alexandra Pantos was an editorial assistant at the ASBMB and is a senior biology student at the University of Maryland.

Rajendrani Mukhopadhyay (rmukhopadhyay@asbmb.org) is the chief science correspondent for the ASBMB. Follow her on Twitter at twitter.com/rajmukhop.

DIVERSITY & INCLUSION MATTERS

A SPECIAL SECTION

Bringing scientific rigor to issues of diversity

By Rajendrani Mukhopadhyay

In 2014, Hannah Valantine became the first chief officer for scientific workforce diversity at the National Institutes of Health. Her charge is to diversify the biomedical research workforce "by developing a vision and comprehensive strategy to expand recruitment and retention and promote inclusiveness and equity throughout the biomedical research enterprise," according to the NIH press release that announced her appointment in January 2014.

Before she arrived at the NIH, Valantine, a cardiologist by training, worked at Stanford University. Her research focused on the mechanisms that play out in acute and chronic transplant failure and in transplant coronary artery disease. She also served as a dean for diversity and leadership.

Valantine's education occurred mostly in the U.K. She was born in Gambia, but when she was 13, her family moved to London, where her father was appointed as the Gambian ambassador. After completing high school, Valantine studied biochemistry at London University and attended St. George's Hospital Medical School. She completed her postgraduate work in the field of cardiology and then moved to the U.S. to train as a fellow in the field of cardiac transplants.

Rajendrani Mukhopadhyay, the chief science correspondent for the American Society for Biochemistry and Molecular Biology, discussed issues of diversity and mentoring with Valantine. The interview has been edited for length and clarity.

What do you think diversity means?

Diversity means bringing together a broad spectrum of perspectives and experiences to solve complex problems. Race, gender, disability, sexual orientation, sex-gender identity — all bring to the table different perspectives. It means bringing together that broad range of perspectives that will help us to do better science.

Are there examples you can point to from your own career where you benefited from diversity?

I've always worked in an interdisciplinary space — to understand the complexities that occur in the management of patients after organ transplantation. That means bringing together a whole range of experts to get the optimal care to the patient. You have cardiac surgeons, cardiologists, sociologists, psychologists, psychiatrists, nurses, students, basic scientists, immunologists, infectious diseases specialists (and) endocrinology specialists. When you get those different experts together, you begin to give optimal care to the patient. In

CONTINUED ON PAGE 16

NATIONAL INSTITUTES OF HEALTH

Hannah Valantine

CONTINUED FROM PAGE 15

working with teams like this, I came to understand firsthand what diversity in a team means (and) how it could result in better care for patients and better research.

If you switch back to the area of diversity, one of the things that I firmly believe is that we have not, to date, applied the scientific rigor that is required to the very complex field of workforce diversity. If we start thinking about the science of diversity and putting together interdisciplinary teams, we have to figure out what strategies actually work, how they work, and how can we disseminate them more rapidly and scale them up.

In an article that I co-authored with (NIH Director Francis) Collins in (the Proceedings of the National Academy of Sciences), we put together four areas that pose as challenges. If (these challenges) are solved, we believe we will be able to enhance the diversity of the scientific workforce much more rapidly than we have previously done.

(One area) is creating seamless

transitions across the different stages of a career path. We know that we lose people at every stage. Even when we have a robust pipeline, because of this attrition, we are at risk of taking a very long time to diversify the workforce. If we can have mechanisms that help people to transition from one stage to the other, then we're likely to get the results that we want. One particular transition point is that transition from the training phase to the independent career phase. That is almost like a valley of death. We lose a lot of people, in particular women. That area needs a lot more resources and work. A lot of my work is going to be focusing particularly on that area.

What do you think is the influence of culture in science?

The culture of the individual scientist is very important. It gives you the perspective of who you are, what your values are and what you bring to the table. Then we have the culture of the institution. Academic institutions, for example, have a very defined culture.

Sometimes those cultural norms get in the way of diversity. The workplace in an academic institution is very focused, 24/7. That's the ideal work culture. Well, that was all invented when there was a different family culture and structure where the man went out to work and the woman stayed at home. But now you have dual careers. It's the norm. But those academic cultures have not adjusted. We perpetuate this ideal worker, which is at odds with the individual worker. It creates tensions and contributes to attrition.

When I was at Stanford, we came up with a program, which we called academic biomedical career customization, to address the culture. It gets people to think about what kinds of flexibility they need over the course of their careers. That was one part of it.

The other part of it recognizes what the cultures are and the support needed to create flexibility. We came up with a time-banking program. We discovered that the culture often pushes one to do work that is not recognized. We call it stealth work. You don't get any additional recognition for serving on search committees, promotion committees, certain kinds of mentoring. Yet you are expected to do it. What if when you stepped up to do those service kinds of work that are supportive of your institution, you could earn credits and then cash in those credits for things that buy back some of your time? For example, if you served on a search committee, we'll give you X number of credits. You could trade those in for support at home — housework, meals delivered to your home — or you could chose to cash those in for help in your work. You could cash it in for support to help you with manuscript writing, grant writing — many things like that would help buy back your time. We found that to be very effective.

I say all this because these things address culture. What we discovered was that people were not taking career flexibility policies. They were concerned they might be viewed as not serious about their careers. There needs (to be) a deep and systemic cultural change.

How do you intend to track success of your programs at the NIH?

We're working in four areas. One is seamless transitions. One is social-psychological factors. One is the science of diversity. The fourth is creating a national strategy. We have metrics all along the way. For example, in the social-psychological area, have we changed the level of bias? Do we change the level of behaviors associated with the biases? Are we seeing a greater diversity in our applicant pools for positions?

CONTINUED ON PAGE 18

CONTINUED FROM PAGE 17

We are viewing the (NIH Intramural Research Program) of the 3,000 or so scientists as a wonderful place to test new approaches.

How have other funding agencies responded to your work?

Very positive. There is a mandate from the White House for interagency collaboration around this work of diversity. There are a number of committees, but one of them is addressing the issue of diversity in the STEM workforce.

In that working group, 13 agencies are represented. I, together with a representative from (the National Science Foundation), co-chair that group. We are asking questions like "What are gaps across the agencies in terms of diversity?" and "What can be done to fill these gaps?" That resonates very much with me, because an additional question that I'm pushing the group to address is "How can we link across the paths?" Way down at the beginning, where you have the education department, what is math capability preparation looking like? And how can it be done better? How are those kids who are going through those programs being tracked so that, when they come into the domain of the NSF, how are we seeing those investments play out? Then further along, when the domain (becomes that of the) NIH, how do you link (up)?

One of the areas that is coming up and resonating across agencies is campus climates. How can we create campus climates of inclusion that give a sense of belonging? You are more likely to recruit and retain people into the STEM careers.

What would you say to people who are in the position of mentoring?

Mentoring means different things to different people. I would say (to the mentors that) the time has come for you to do it again with the same scientific rigor as we do everything else. We need to test, figure out what works and in what context, and come up with models of effective mentoring. We have to determine whether mentor training is needed, how it should be delivered, who should be trained and, most importantly, how it can be evaluated.

Some of this work is already going on through the National Research Mentoring Network, the NRMN. This is one of the large programs that the NIH launched last year. The NRMN comes from the idea that a lot of the students that we want to recruit and train do not have adequate mentoring. Perhaps we can have a national system that could link mentees (students and trainees) with mentors across the country and have mentoring take place almost electronically. The whole system is being set up, and we are recruiting vigorously to match mentor and mentee and also to train mentors.

Can you point to times over the course of your career when you felt the effects of a lack of diversity?

Growing up in Gambia until I was 13 and moving to England in the 1960s at the height of racism – it was quite shocking to me to have to make that shift in culture. Being the only black kid in the school, as opposed to being part of a majority, was very challenging. It is a time in your life, age 13, when you least want to be different. You want to be the same as everybody. It was very difficult for me to find my feet, to know where my place was, to the extent that by the end of high school, I wasn't even sure that I wanted to go into university.

I took a year off. In that year, I found that I really did want to do sci-

LINDA A. CICERO / STANFORD NEWS SERVICE

Valantine addressing the Stanford University Faculty Senate when she was a dean for diversity.

ence. I started to work in a microbiology lab and then went back to a biochemistry undergraduate (program). I had great support and didn't look back thereafter.

You took a year off to work in a microbiology lab? Eighteen-year-olds normally don't gravitate to that!

Yes! I worked for the Metal Box company in a microbiology lab. Metal Box sold cans to the customers who make food. The customers filled food into the can and then put the top on. But occasionally a leak occurred and bacteria grew. They would send (the cans) back to culture the bacteria and test the cans. It was very exciting for me to take this food, plate it on agar dishes and, a few days later, see growth of microorganisms. I was very excited to see in action what had been taught in the classroom. That was my first inkling of how science means something in the real world.

But in going through medical school and then residency in London, there was no diversity at all. Very few women were at the level of what you call attending here, but we call them consultants there. All white male. I had to have supporters and mentors who were very different from me. They had to be, by definition.

When I went into cardiology in London, there were two women who were consultant cardiologists. Imagine that. But it didn't matter. What that taught me is that even though you benefit greatly from role models and seeing others like yourself — it gives you a sense of resilience and the belief that you too can make it — I do think we ought to be very clear with trainees that mentors do not have to necessarily be like you.

Quite honestly, we are still in a state where the higher echelon is occupied by certain groups. The key thing,

NATIONAL INSTITUTES OF HEALTH

Valantine oversees scientific workforce diversity at the National Institutes of Health, the largest biomedical research agency in the world.

I believe, as a trainee is to get yourself into that network. That often means finding mentors who, by definition, will not look like you. Does that mean they are not going to help you? No, often they do.

Some of my best mentors and supporters looked nothing like me. They were committed. They did more than mentoring. They did sponsorship. What that means is that when there was a job that I was interested in, they didn't just write a letter; they picked up their phone to their buddies and said, "You have to take this person because she's the best."

The other thing (your sponsors) do is that, when you start doubting yourself, they don't allow you to doubt yourself. You go to them and say, "I'm thinking about a family, and I don't think …" They won't necessarily say, "Here's the lighter path." If they are true sponsors, they'll say, "Well, I understand the difficulties, but I know you can still do it. You've got it in you. Go for it."

The best sponsors are people who are able to see what your potential is and don't allow you to doubt yourself. That's what we need more of.

Rajendrani Mukhopadhyay (rmukhopadhyay@asbmb.org) is the chief science correspondent for ASBMB. Follow her on Twitter at twitter.com/rajmukhop.

Questioning the impact of role models

By Takita Felder Sumter

Several years ago, I worked with a colleague on an approach to teaching general chemistry that used medicinal models to illustrate common concepts. This approach worked well for students because it made the material relevant and allowed us to reference neuroscience, chemistry and biology. The main issue I encountered with the approach was a lack of resources for teaching coupled with my own limited ability to describe certain phenomena – like drug-receptor interactions – in lay terms. To help, a trusted mentor recommended the book "Molecules of Emotion" by neuroscientist and pharmacologist Candace Pert and cited its scientific accuracy and use of analogies (1).

The mentor was right about the book. It proved a useful teaching aid. But it turned out to be much more than that. Pert discovered the opioid receptor in 1973, which ultimately led to her principal investigator's receipt of the Albert Laskar Award in 1978. From Pert's point of view, her gender and student status kept her from being cited or recognized for her experimental contributions. The book goes on to describe Pert's successful career both in neuropharmacology and in the science of psychosomatic medicine while painting a balanced picture of the gender biases encountered along the way. This great read now has become a notable addition to my library and a source of inspiration.

One would think that — unlike 40 years ago, when Pert was a young scientist — the presence of successful female scientists would convince girls that science research is a feasible career option. Reports by Diane Halpern at the Keck Graduate Institute and colleagues suggest that teachers now regularly expose their students to positive role models in science, technology, engineering and math through case studies, biographies and classroom visits (2). Having visible role models from a variety of ethnic, racial and socioeconomic backgrounds sends the message that STEM fields are composed of all kinds of people. These efforts are designed to address gendered and ethnic norms (although some suggest that the ethnicity of the role model may not matter). It turns out that these approaches may work best for those who are already on the path to a STEM career.

Similar efforts with younger groups may not have the same impact. Denise Sekaquaptewa's group at the University of Michigan posits that female role models also can deter a young girl's interest in pursuing a science or math career (3). Their work suggests that, because the role models were viewed as having violated gender stereotypes, middle-school students in the study became both less interested and less confident in their STEM abilities. I imagine that these same principles would apply to underrepresented minority role models. There is often a perception that one must change one's outward behavior, or shift, to navigate cultures where one is in the minority.

There is also a message implicit in our attempts to broaden participation and interest in STEM. A listener who's already on the STEM track likely would receive the idea that the sciences want more ethnic and gender diversity as an indication that the fields welcome all who have the interest and curiosity to excel. A listener undecided about a STEM track, on the other hand, could receive an unintentioned message that the target groups should expect a unique set of obstacles. This certainly could provide another explanation for why female role models demotivated the young middle school girls in the University of Michigan study.

Mary Murphy at Indiana University has additional data suggesting that the perception they will be outnumbered by men can lower women's motivation to enter and participate in male-dominated science settings (4).

With all of the active efforts to highlight the significance of scientists as both role models and key contributors to discovery, the best means of successfully attracting and retaining women and minorities in STEM careers remains unclear. The National Student Clearinghouse reports that only 12 percent of the 2014 bachelor's degree recipients were women majoring in experimental science or engineering (that is compared with 26 percent for men).

Stereotypes about science and scientists strongly influence our plans and profiles. Anecdotally, most pre- and early teens, including women and underrepresented minorities with an acumen for science and math, seem more likely to identify engineering or

medicine than physics, chemistry or biology as career tracks. It's possible that this is at least partially the result of not knowing anyone who has pursued those career paths. To that end, it may be more important to have scientists engage in community mentoring than one-hour career day events.

Women and underrepresented minorities are also more likely than their peers to pursue careers outside of research or academic science. It's possible that our examples of struggle influence those decisions.

On another note, Laura Ramsey at Bridgewater State University has conducted research that suggests that both students and faculty view science as noncollaborative (5). Certainly, when I was a graduate student and postdoctoral fellow, I remember a number of women faculty who were referred to as having been "hardened by science." Their stellar work and international reputations somehow counted against them.

Finally, there is a need to consider the extent to which people's commitment to social justice, stereotypes and other factors drive their career decisions (6). It could be that some view science as incompatible with their personal priorities, while others view science as career that completely supports those priorities. Because these priorities will change over time, it would interesting to resurvey the young girls from the University of Michigan study at intervals of five, 10, and 15 years.

We all have an innate desire to inspire and to serve as role models. It provides an excellent foundation for us to be inclusive in all that we do. I also believe that innovations in the K – 12 models for teaching and learning, along with national calls to improve STEM performance, will inspire a greater number of students from all backgrounds to pursue STEM degrees. In the meantime, the scientific community should continue to be intentional in its endeavors to accomplish the following:

1) **Diversify scientists at all levels, particularly among academic and government leaders**. There are a number of programs that train faculty to lead academic agencies. However, the number of women and underrespresented minority scientists in leadership positions remains very low.

2) **Increase our understanding of the best practices for training our workforce, with a specific emphasis on those that have been underrepresented in STEM fields.** Formal, scientific assessment models of many mentoring programs have been designed. Scientists must stay abreast of this literature and educate their students and colleagues about the various challenges and potential interventions available.

3) **Advocate for shifts in institutional paradigms.** For a long time, science has been perceived as an individualistic and competitive pursuit. This may be a deterrent to those who value collaboration and communal lifestyles.

We all have been inspired to pursue science and may genuinely believe that role models influence all aspiring professionals regardless of their goals or backgrounds. Let's reflect on that and remind others around us of our enthusiasm for the great work that we do. Be it science policy, research or teaching, our contagious enthusiasm for inquiry — past, present and future — can help drive us, and others, to greatness.

REFERENCES

1. Pert, Candace, *Molecules of Emotion, New York: Simon and Schuster*, 1999.
2. Halpern, D.F., *et al. Psychological Science in the Public Interest* **8**, 1 – 52 (2007).
3. Betz, D.E., and Sekaquaptewa, *D. Social Psychological and Personality Science* **3**, 738 – 746 (2012).
4. Murphy, M.C., *et al. Psychological Science* **18** (10), 879 – 885. (2007).
5. Ramsey, L.R., *et al. Social Psychology of Education* **16** (3), 377 – 397 (2013).
6. Diekman, A.B., *et al. Psychological Science* **21**(8), 1051 – 1057 (2010).

Takita Felder Sumter (sumtert@winthrop.edu) is a professor of biochemistry at Winthrop University and chair of the ASBMB Minority Affairs Committee.

Opening my mind

By Andrew Hollenbach

I've always considered myself an open-minded person. I now realize that I wasn't always as open-minded as I'd thought.

I come from a very small, rural town in Pennsylvania and had a sheltered upbringing. This is not because my parents intentionally shielded me from other ways of thinking or living but simply because of the environment in which we lived. Southeast Pennsylvania is heavily populated with Pennsylvania Germans (or Pennsylvania Dutch as they are known). German names like my own and Kramer, Lichtfuss, Fenstermacher and Schultz are common. A majority of the students in my graduating high school class were Lutheran, Mennonite, Presbyterian or United Church of Christ. Because of the makeup of this population, I couldn't help but have what many might consider to be a limited worldview.

During my college years, I met and became friends with people of very different backgrounds, ethnicities, religions and philosophical bents. But even then, many of these people were still from the Middle Atlantic region, so their general mentality was similar.

It was during my graduate school years that my mind really expanded when I met and befriended people from all over the country and the world: Afghanistan, India, Korea, Pakistan, Burma, Sri Lanka. During my postdoctoral years, when I met people from Europe or the Caribbean, my mind opened ever further to different cultures and ways of thinking, and I adopted the view that even though we may come from different parts of the world and have disparate beliefs, we are, in essence, all the same.

In my graduate and postdoc years, I began to acknowledge and explore my sexuality and to think about how it related to what I knew and believed. Throughout my life as a gay man, I've had to endure many different and sometimes hurtful opinions about who and what I am. Not once have these words been said directly to or about me. Instead I heard them expressed by people who didn't realize I was gay or through word of mouth, the media or society in general. Part of my journey has been deciding whether to tune these opinions out or to think hard about myself, thicken my skin and stand up for what I believe.

I feel very fortunate that the institutes where I've worked have been supportive of me as a gay man. I remember interviewing for my present faculty position and being asked why I wanted to move to New Orleans. When I said, "Well, my partner, Joe, lives here and I want to be with him," the response was not shock or disgust. It was indifference — indifference because, for the people with whom I interviewed and now work, my situation was the same as it would have been if Joe were a she and my wife.

Further illustrating the commitment of my institute to lesbian, gay, bisexual and transgender issues, I was recommended by an associate dean of our school to apply to be on the Association of American Medical Colleges' Advisory Committee on Sexual Orientation, Gender Identity and Sex Development. At the first meeting of this committee, I felt like an impostor. I was surrounded by eight people who were leaders in the field of LGBT health issues. But I opened my mind and soaked up everything I could, and, very quickly, the members made me feel welcome and an important part of the work we were doing.

Even though I knew the LGBT community was diverse, the full complexity of this diversity was unimaginable when I began with the committee. Yes, there are the "simple" situations like mine — I am a man who identifies as male and whose sole sexual attraction is to men. However, there are also individuals who are assigned as male or female at birth but who identify as the opposite gender and wish to modify their appearance, either by dress or through physical changes, so that how they present themselves to society matches the gender with which they identify.

Adding further complexity is the fact that a person's sexual orientation — the gender to which they are physically attracted — is independent of the gender with which they identify. For example, a transgender male (a person who is born female but identifies and presents as male) may be sexually attracted to men. Include the many people who are in the process of coming to terms with who they are, and you can see how vibrant, diverse, complex and fluid the LGBT population is.

Independent of but often associated with these populations are those individuals affected by differences of sex development, or DSD. Formerly referred to as hermaphrodites or intersex, these people are often lumped into the LGBT population and considered to have the identity of DSD. However, being affected by DSD is not an identity. It is a biological difference that influences sexual development, which in turn contributes to

how DSD individuals identify with respect to their gender. As such, they, like any single letter of the acronym LGBT, must be viewed as individuals with individual needs, wants, dreams, desires, opinions and lives.

Although I was always aware of these various aspects of my community, I never fully appreciated how multifaceted and wonderfully diverse it all truly is. Through patience, passion and willingness to explain and educate, the members of the AAMC committee took me to new levels of awareness and appreciation. They opened my mind further than I ever thought possible. By exposing me to the true richness of diversity, they ignited a flame of passion in me and a strength to stand up and advocate for those who are underserved because of their difference.

The people on this committee also ignited my desire to educate others so that every single person can receive the care and respect they deserve as a human being, regardless of how they present to society, whom they love, or to whom they are attracted. I brought what I learned on this committee back to my institution, where I serve as a member of our curriculum renewal committee, advocating to incorporate LGBT health issues into our medical school curriculum. As part of our newly revised curriculum, I now deliver lectures on LGBT health disparities to our medical and physician assistant students.

I often think back to the person I was 15 years ago and realize that person would not recognize the me of today. He would be shocked but, I think, proud of who I am now and what I have accomplished. The person I was then lacked the strength to be honest with himself. I was afraid of people knowing my truth and assumed that they would judge me unfairly. Now, because of my journey and the work that I did and continue to do, I not only proudly live the life I was born to live but also am a national and institutional advocate for those who have not yet found the strength to be who they were born to be.

"By exposing me to the true richness of diversity, they ignited a flame of passion in me and a strength to stand up and advocate for those who are underserved because of their difference."

– ANDREW HOLLENBACH

Yes, people may still judge me for the way I was born. But instead of making me feel inadequate, it now makes me angry and fuels my conviction. I've come a long way from that small-town Pennsylvania Dutch upbringing. I regret nothing in my journey from those early days to now and am ever thankful for the family, friends and colleagues who have supported me and for the many opportunities that have opened my mind.

Andrew Hollenbach (AHolle@lsuhsc.edu) is a professor in the genetics department at Louisiana State University Health Sciences Center in New Orleans and the lead editor for the AAMC publication "Instituting Curricular and Institutional Climate Changes to Improve Health Care for Individuals who are LGBT, Gender Nonconforming, or Born with DSD."

YOUR VOICES ON DIVERSITY & INCLUSION MATTERS

PART ONE OF AN ONGOING DISCUSSION

We asked our members and affiliates to tell us how they perceive the state of diversity and inclusion — the lay of the land, so to speak — in the field of biochemistry and molecular biology. Here, we've printed what they had to say. In future issues, we will dive deeper into the discussion of what can be done in the short term and in the long term. We welcome your contributions. Email us at asbmbtoday@asbmb.org.

Inclusion enriches output and awareness

I believe that inclusion of people from different racial and ethnic backgrounds in research greatly enriches both our science output and cultural awareness. For example, research on diseases relies on the diversity of patients and samples, and a diverse research team can facilitate the recruitment of diverse study participants. It is also evident that working in a multicultural environment does change our views and perceptions of other people whom we unconsciously think are different from us. Although diversity is mostly associated with race and ethnicity, a homogenous group can still be diverse in areas less often considered — like professional training, country of origin and life experiences. I think we need to start looking at diversity beyond what is visible. But this does not come to replace what diversity was initially intended: to bring members of underrepresented populations, women and other groups into science settings and participation. This diversity would not only broaden research questions and opportunities but also improve our cultural understanding for one another.

Joshua Muia is an instructor of medicine at Washington University School of Medicine in St. Louis.

ASBMB meeting speakers lack diversity

The diversity efforts are inconsistent and only as good as those constantly reminded that they need to be inclusive in their work, committees and output. The featured speaker list for (the ASBMB annual meeting) this year is an example of a lack of diversity. Few women, fewer minorities. We all need to be reminded to be cognizant of the issue. I teach courses that include diversity in health care from a science and research perspective, and I also teach gender in science and engineering. Many ASBMB members are not trained in these areas and don't always understand how the workplace and education have changed and need to continue to change to attract and retain a diverse set of scientists.

Marilee Benore is a professor of biology and biochemistry at the University of Michigan–Dearborn.

Differently-abled individuals are the next frontier

The National Science Foundation's Women, Minorities and Persons with Disabilities in Science and Engineering report, which is released every other year, has shown a trending increase in the number of awarded STEM doctorates in the United States over the past decade. The good news is that there has been a corresponding increase in doctoral degrees awarded to African-American and Hispanic scientists. Unfortunately, over the past decade, the proportion of doctorates awarded to disabled scientists has decreased.

This is surprising because we'd think that the protections secured by the landmark Americans with Disabilities Act, passed in 1990, would have had a more positive effect after two decades. The ADA has been fairly successful with improving access to education. What the ADA hasn't been able to secure are the other ingredients essential for success: removing biases, prejudices, and discrimination; social capital in the form of professional networking; and aspirational capital in the form of successful role models.

ASBMB Today asked me if the field of biochemistry and molecular biology embraces or discourages diverse voices and experiences. I had difficulty answering this question, because the scientists who work in these fields display a spectrum of attitudes and behavior. I have been fortunate to meet and work with remarkable scientists who embrace diverse voices; I have also unfortunately met some who actively discourage these voices; but most scientists I've worked with are unaware of the challenges facing disabled scientists.

ASBMB Today also asked: Are women and minorities given a seat at most tables? I interpreted this question to mean: "Are disabled scientists proportionately represented in positions of power within the field of biochemistry and molecular biology?" Clearly, the answer is no. Fourteen percent of the population between the age of 21 and 65 is disabled; however, if you examined the composition of the biochemistry and molecular biology faculty at any university, any conference committee, or any editorial board, you will most likely not ascertain a 14 percent representation of disabled scientists.

Finally, ASBMB Today asked how having people of color, women, LBGT and differently-abled individuals at the bench or in the classroom enriches scientific perspectives. Scientists are human too, and we seek out and direct research according to our passions. By having a workforce with diverse backgrounds and perspectives, we accordingly increase the diversity of our lines of scientific research. My own research, for example, focuses on the commonest form of genetic deafness from a genomic and population genetics perspective. Previous researchers who studied this form of genetic deafness have focused on it from a diagnostic and clinical perspective. As a deaf person, I carry a natural interest in deafness that goes beyond medicalization. I believe that there are secrets in our genome about human history and disease that can be unlocked by studying genetic deafness.

Derek C. Braun is director of the biology program and the molecular genetics laboratory and a professor at Gallaudet University.

Awards and the Matilda effect

It's 2016, and the Matilda effect is alive and well.

Named after 19th century American women's activist Matilda Gage and first noted by science historian Margaret Rossiter in 1993, the term describes the systematic undervaluation of research done by women in favor of men. As documented by the RAISE project, the world's largest awardees database, men are significantly overrepresented in both award nominations and success, whereas women are underrepresented. A mere 2.5 percent of all STEM Nobel Prize winners and 2.1 percent of the prestigious mathematics Fields Medal recipients are women. Only this week, we learned that 95 percent of 2016 national awards of the American Chemical Society were awarded to men even though women made up 17 percent of the nominee pool and constitute 29 percent of the 158,000-strong membership.

Why is this a problem? Awards and prizes are widely accepted markers of professional achievement that influence salary, promotion and tenure decisions to shape and advance careers. Studies show that the gender disparity in awards is recurrent and unrelated to "pipeline" issues. Women are less likely than men of equal ability to self-promote and seek nomina-

CONTINUED ON PAGE 26

CONTINUED FROM PAGE 25

tions because of persistent cultural beliefs in the capabilities of men and women. The prize criteria evoke strong stereotypes associated with men, calling for "leaders" and "risk-takers." Unconscious gender bias is propagated through recommendation letters, which use more standout adjectives and fewer grindstone words in describing male applicants compared with female. Most importantly, the gender composition of the awards committee has crucial effects on outcome, with success rates for women strongly tied to the number of women involved in selection.

With this background, how does the ASBMB fare? Not badly! In the past four years (2013 – 2016), 32 percent (17 out of 53) of national awards have gone to women. However, there are notable problems: Four awards have included zero women (education, Merck, Vallee, and Stadtman awards), and four have included only one (DeLano, Kirschstein, Tabor and Wang awards). A smaller number of awards are well represented by women: two of four (ASBMB Young Investigator and Shaw awards), three of four (Rose and Avanti awards) and four of four (Cohn award). We can do better. For detailed analysis of the Matilda effect and concrete guidelines on how professional societies such as the ASBMB can promote diversity and ensure gender equity, see our latest blog post on STEMWomen.net.

Rajini Rao is a professor of physiology at the Johns Hopkins University, has chaired the Committee on Professional Opportunities for Women at the Biophysical Society and is co-founder of STEMWomen.net, a blog site dedicated to promoting the careers of women in science.

A need for more minority leadership

Are women and minorities given a seat at most tables? The Minority Graduate Student Network was first created as a support network for minorities in graduate programs throughout New York City. Since its inception it has grown to provide professional development, career opportunities and leadership training as well. Feedback from members indicate that leadership positions within academics and industry often lack underrepresented minority representation or do not address many of the circumstances that concern minority students in the sciences. MGSN now has a reach of more than 400 local students. As the number of students voicing similar concerns within MGSN grows, it must be considered that more minority advocates in leadership positions are needed.

Rodrigo Valles Jr. is the associate program director at Hunter College, City University of New York, Center for Translational and Basic Research. He wrote on behalf of the Advisory Board of the Minority Graduate Student Network.

Underrepresented minorities are game changers

I've seen more appreciation for challenges that face women, LGBTQ and minority scientists in the past two years than I have seen in the prior two decades. While these groups are now being included to some degree, where I see the biggest changes are that we are doing far better at calling out harassment and bias. Even with that, I think we have yet to hear the real angst of the LGBTQ community, because it is still unsafe for many scientists to come out, as many states still don't have nondiscrimination protection (see http://bit.ly/1P23XLs) and you can be fired for being gay.

While these conversations of inclusion are coming to the forefront, I worry that the problems of unconscious or conscious racial or gender bias have become more covert. I see a lot more "punching down" — where there is a real push to stabilize funding for near-retirement principal investigators or even well-established groups. It's pretty obvious that the groups that are going to be most impacted by senior PIs getting more earmarked money will be the most vulnerable junior and midtier investigators who are far more diverse. That tension hasn't been well addressed, and I don't see that the National Institutes of Health can have it both ways.

I hate that so many universities and societies seem to be reinventing the wheel for themselves and hoping that simply getting a diverse faculty on campus will solve their problems. There seems to be genuine shock that a female, LGBTQ or underrepresented minority wouldn't simply be grateful for a job. I'm always surprised when people are unaware that these folks are

going to be game changers. And that's a great thing. Everyone in my lab is either a woman or from a racially underrepresented group — or both — and I couldn't wish for a better group of people. They are smart as all get-out, will ask and then answer the best questions, read everything and are crazy enthusiastic about getting work done. I love that they know there is no one else who will be effecting change and that they need to do it. You can't teach this. It comes knowing they have great obstacles and hopefully powerful cheerleaders making opportunities for them.

BethAnn McLaughlin is an assistant professor of neurology and pharmacology at Vanderbilt University and TheEdgeforScholars.Org's director of awesome.

Expand diversity efforts from the top down

Although gains have been made in encouraging diversity from the ground up, our efforts must be expanded from the top down. For the fields of biochemistry and molecular biology to flourish, diversity must not be just a noble goal — it must be a priority. Research fellowships targeted specifically to underrepresented minorities, along with scholarship and internship programs seeking to improve access for underrepresented minority students to universities and industry, are only the beginning. These efforts must be paired with the support and guidance of faculty and administrators. Achieving buy-in from faculty already overburdened with tenure and promotion requirements is realistically achievable only if the pursuit and maintenance of diversity in science is stated as a priority on the department, college and university levels. This becomes possible once outreach, science communication and mentoring efforts, particularly those targeted to underrepresented minorities, become required, rewarded and valued. High-quality efforts toward enhancing diversity need to become a prominent feature of our academic system, not just something that is occasionally recognized in a department newsletter or a tweet.

Rick Page is an assistant professor in the chemistry and biochemistry department at Miami University.

Helping everyone be successful

The thing about diversity is that there is no single definition about what makes someone diverse — we all take different paths and contribute valuable life skills and perspectives based on our journey. What we have in common is that we all deserve to be successful and the opportunity to make an impact. Never make an assumption that someone doesn't need help, even if they seem to be thriving. We all need support, but that will take different forms for different people. Some of us internalize stress or never ask for help because we don't want to feel singled out from the rest of the group. The most important question to ask of others, especially those you mentor, is "How can I help you be successful?" Then truly listen and connect us to the resources we need to ensure success, whatever that may be.

Donna Kridelbaugh is a writer, editor and career matchmaker at Science Mentor Consulting.

Diversity is critical for scientific progress

Although I am not a member of an underrepresented group, I do teach at a historically black college or university. Based on my experiences in the classroom and laboratory over the past 30 or so years, I can say without a doubt that diversity is critical for promoting creativity and finding solutions to problems. Science itself is a creative process. Solutions to scientific problems do not arise out of

CONTINUED ON PAGE 28

CONTINUED FROM PAGE 27

thin air but instead arise from scientists as creative agents who bring their whole personalities and all of their talents and life experiences to bear on the problem at hand. Clearly, the greater the diversity of the workforce, the greater the likelihood that creative solutions will be found. Some citizens in high places do not recognize this fact, but this could be because they are not familiar with how science works.

As proof that diversity promotes creativity, I give you the example of the great biologist Ernest Everett Just, who lived and worked in the first half of the 20th century. He proposed a theory of how cytoplasmic factors and chromosomes in the nucleus of the cell interact during embryonic development. Just's theory (of "genetic restriction") opposed the gene theory of Thomas Hunt Morgan, who later won a Nobel Prize. Recently the case has been made that Just's epigenetic theory of nuclear–cytoplasmic interaction, which has been shown to have considerable merit, bears close similarity to sociological ideas involving intercultural dialogue that were prevalent in the African-American intellectual community at the time. Because E.E. Just was immersed in this community and deeply familiar with black intellectual thought, he was perfectly positioned to put forth the unique ideas that he did. Thus, he embodies the notion that unique perspectives can spawn unique scientific contributions. Of course, what is true about ethnicity is true about any kind of characteristic or set of experiences. Diversity of all types promotes creativity and scientific problem solving.

W. Malcolm Byrnes is an associate professor of biochemistry and molecular biology at Howard University College of Medicine.

Diversity is about uniqueness

Diversity is recognizing that while we are all the same, we are also all unique and bring our unique differences to bear on what science we work on, why we work on what we work on and how we approach what we work on.

Avery August is a professor of immunology and chair of Cornell University's microbiology and immunology department in the College of Veterinary Medicine.

Sexual harassment and the importance of inclusion

As the community has reacted to sexual harassment in many different forms, we are reminded of a bigger problem in all STEM fields. Gender equity is an ongoing problem especially at higher ranking positions. This results in inexcusable behavior that occurs far too often. Whether it is microaggressions or sexual harassment or a host of other offenses, it is essential to urge all individuals to carefully consider their words and actions toward others. To build a more inclusive community, we must recognize our own unconscious biases or inappropriate behaviors, take responsibility for our actions and consequently change our attitude toward others. For those who cannot treat others with the respect everyone so rightly deserves, consequences should be administered to remedy the problem.

Also, there is a distinct difference between diversity and inclusion that should be recognized in order to create an equitable landscape in any STEM field. Merriam–Webster refers to diversity as "the quality or state of having many different forms, types, ideas, etc." and "the state of having people who are different races or who have different cultures in a group or organization." Inclusion refers to "the act of including: the state of being included." You can have diverse organizations or fields, but it can be meaningless if not all individuals feel included. We need to work not only to increase diversity in STEM fields but also inclusivity, as we are unlikely to increase the first without the second.

Shaila Kotadia is the education, outreach and diversity manager for Synberc at the University of California, Berkeley.

Discrimination is country-dependent

The status of diversity and discrimination is country and time-dependent. When I immigrated to Canada 30 years ago, the professional standards related to discrimination by gender, religion, color, sexual preferences, etc. were somewhat relaxed. I have seen the progressive change of these standards from the state of "some tolerance" to a state of "zero tolerance." My current institution is very vigilant regarding issues of equality, discrimination and harassment in the workplace and is continuously educating the staff on what is acceptable and what is not. There are serious consequences for offenders, and there are professionals who listen to and handle complaints. Bottom line: There is no more a gray zone for discriminatory or abusive behavior in the workplace, and workers are encouraged to report offenders, who may get punished severely for inappropriate actions (even if such actions are purportedly intended as "jokes").

My interaction with international colleagues has confirmed repeatedly that professional standards related to diversity, discrimination and harassment are very different in other countries. I have witnessed clear cases of sexual harassment in the workplace (verbal, touching, joking, etc.) that seem to pass unnoticed by the victims. Clearly, the lack of strong directives on what is permitted and what is not permitted in the workplace encourages abusers to continue their customary behavior and discourages the abused from reporting them.

In my estimation, eventually, in most countries, institutions will adopt the principles of zero tolerance, educate all employees on what constitutes discrimination and abuse, and will open specialized offices that will deal with education, counseling and punishment of offenders. When these policies are in place, I predict that all forms of discrimination and abuse in the workplace will be highly diminished.

Eleftherios Diamandis is head of the clinical biochemistry division at Mount Sinai Hospital in Toronto, Canada, and division head of clinical biochemistry at the University of Toronto.

Comfort of quick consensus may suppress diversity

Imagination is often essential to making a transformative breakthrough. Scientists routinely imagine how molecules move and fit together, anthropomorphize proteins and cells, and try to draw useful analogies between familiar everyday phenomena and molecular events that can be detected only indirectly. These mental exercises can be strongly influenced by each scientist's personal perspective. Brainstorming to crack a previously intractable problem is obviously less effective if every person's vision is similar. Similarly experienced individuals may rapidly reach consensus, but they may miss the chance for a creative leap forward. The comfort of that quick consensus may be one driver of the implicit bias that suppresses diversity in the field. Nevertheless — in addition to the clear demands of fairness and the personal benefits of working with a varied group of colleagues — research by diverse teams is both more rewarding and more original.

Despite broad and explicit institutional commitments to inclusion and official invitations to women and members of underrepresented groups to join scientific leadership, representation is still low. The persistent barriers to parity may be founded on outdated or biased evaluation strategies and unconscious discrimination by benevolent but still unenlightened leaders. Moreover, dissenting hypotheses may not be welcome even when well supported by data — particularly if out-of-the box ideas are put forth by those who don't outwardly conform to the accepted scientist phenotype. We have hope in sustained efforts to research and address the structural obstacles to equality and, importantly, efforts to effectively educate those already in power about how to be welcoming, open-minded and inclusive.

Jean Cook is an associate professor of biochemistry and biophysics and associate dean for graduate education at the University of North Carolina at Chapel Hill.

Diverse groups perform best

As scientists, we should be driven by data. I think perhaps the most powerful argument for the importance of diversity is the established scientific fact that groups of diverse problem solvers actually can outperform groups of high-ability problem solvers. See Hong and Page's paper in the Proceedings of the National Academy of Sciences (1). That study settled the question of the tangible benefit of diversity for me. But of course, whenever policies that affect people are concerned, there is also the question of simple human decency. I find it reassuring and heartwarming that diversity is beneficial to our practical outcomes as well as to our sense of humanity.

Gregory A. Petsko is a former ASBMB president. He is the Arthur J. Mahon professor of neurology and neuroscience and the director of the Helen and Robert Appel Alzheimer's Disease Research Institute at Weill Cornell Medical College.

REFERENCES

1. Hong, L., and Page, S., *Proc. Natl. Acad. Sci. U.S.A.* **101**, 16385 – 16389 (2004).

Societies and institutions need to do better

My experience as a member of ASBMB for most of my career and an especially strong advocate for inclusion for minorities and women for just as long of a time, is that BMB (i.e., the ASBMB) is just like all of the other sciences and societies (the Endocrine Society, the Federation of American Societies for Experimental Biology, the American Society for Cell Biology, etc.) in that they love to talk the talk about diversity and inclusion, but all you have to do is look at the numbers (memberships, officers, administrators, sessions/themes at conferences, etc.) to see that no one is really walking the walk. Am I cynical? Just honest, frustrated and angry that science and, actually academia in general, is discriminatory, elitist and totally not about embracing what benefits inclusion can offer. The problem? White privilege has long ruled the academy, and society for that matter. And as someone who has fought intensely against that for many years, I don't see it changing anytime soon. This is especially disappointing when, as scientists, we see the paucity of diversity everywhere but are really not committed to try and fix it. Hell, even the National Institutes of Health, which talks a lot about diversity and has actually numerous programs designed to achieve it, only has 2 percent black principal investigators! What does that say?

Thomas Landefeld is a professor of biology at California State University, Dominguez Hills, and author of "Mentoring and Diversity: Tips for Students and Professionals for Developing and Maintaining a Diverse Scientific Community."

Evidence-based training and mentoring practices

Practical implications for improving diversity in STEM education and training

Recent national conversations about the benefits of diversity in university science classrooms are stimulated in part by a case before the Supreme Court of the United States that has reignited a firestorm of interest in how diversity is engaged, or not, in many areas of science, technology, engineering and mathematics (1). In the backdrop of these intense and needed discussions, there is a growing recognition in biochemistry and many other areas of STEM that an increased ability to identify and integrate evidence-based practices for recruiting, training and retaining a diverse pool of individuals and for improving mentoring for broadening participation is needed (2 – 5). The specific roles and responsibilities that STEM professors and administrators, particularly those receiving federal funding, should have in securing future access and success for individuals from diverse backgrounds to participate in STEM also are being debated. Related to this, a need to document the outcomes of broader impacts and outreach, particularly those efforts supported with public funding, is a growing concern for many. There have been calls for public funding agencies, which provide substantial financial research support to a large number of institutions that continue to struggle with recruiting and retaining student body populations and faculty compositions that reflect national demographics, to serve as catalysts in driving needed changes through supporting evaluation of progress and evidence of advancement and dissemination in the areas of broader impact, in addition to more widely accepted metrics for primary research efforts, for funded endeavors and continued eligibility for funding (4, 6 – 8). These concerns represent an opportunity for the development of progressive and potentially transformative initiatives that center the work of broader impacts and attempts to promote diversity in STEM in the effective engagement of evidence-based mentoring and outreach practices. One potential avenue for promoting such change is through research partnerships or "communities of practice" that include STEM primary investigators and higher education researchers in the social sciences, education and organizational development who are studying factors contributing to STEM success. There is great potential for such efforts to play a critical role in accelerating progress in improving diversity in STEM recruitment, retention, education and training to sustain our nation's STEM educational enterprise.

REFERENCES

1. Isler, J. C. (2015) "Being Black in Physics Class." The New York Times.
2. Valantine, H. A. & Collins, F. S. *Proc. Natl. Acad. Sci. U.S.A.* **112**, 12240 – 12242 (2015).
3. Whittaker, J. A. & Montgomery, B. L. *J. Undergrad. Neurosci. Educ.* **11**, A44 – A51 (2012).
4. Whittaker, J. A. & Montgomery, B. L. *Innovative Higher Education* **39**, 263 – 275 (2014).
5. Whittaker, J. A. *et al. J. Undergrad. Neurosci. Educ.* **13**, A136 – A145 (2015).
6. Nadkarni, N. M. & Stasch, A. E. *Front. Ecol. Environ.* **11**, 13 – 19 (2013).
7. Sherley, J. L. *Science* **334**, 901 – 903 (2011).
8. Fortenberry, N. L. *et al. J. Women Minor. Sci. Eng.* **15**, 245 – 261 (2009).

Beronda L. Montgomery is a professor of biochemistry and molecular biology at Michigan State University.

Where do we go from here?

By Marion B. Sewer

A diverse workforce is critical to ensuring that the U.S. remains at the forefront of the disciplines of science, technology, engineering and math. Diversity enhances the breadth, depth and quality of research and increases innovation by engaging people with a variety of experiences and perspectives. It is projected that by 2050 the demographics of the U.S. will have shifted profoundly, and Hispanics and Latinos will represent nearly one third of the population. These statistics point to the critical importance of a multipronged approach that insures the STEM workforce diversifies. While undergraduate research training programs such as Minority Access to Research Careers have evolved significantly since I was a MARC fellow over two decades ago, there is room for developing additional strategies in STEM-centered training programs so that the next generation of scientists reflects the demographic makeup of the country. Equally important are the development and expansion of targeted strategies to capture minority scientists that are lost at key junctures along the training pipeline.

Here are potential strategies that may help to broaden inclusion of underrepresented minorities, or URM, in STEM:

Foster diverse skills

Undergraduate research programs attempting to broaden URM participation have emphasized the development of technical skills, with the hope that these experiences would spawn an interest in STEM-related research careers. But summer and year-long research programs that foster the development of a more diverse cadre of skills also are warranted. These programs should stress bioscience career skills that are vital for success, such as communication, critical thinking, problem solving and collaboration. Perhaps most importantly, undergraduate research programs should develop activities that boost confidence and a sense of belonging and address the psychosocial issues associated with trying to assimilate into an institutional climate that is vastly different from one's life experiences.

Attach federal requirements

Federally funded training programs should require that participating institutions and laboratories train all workers in the areas of cultural competency, implicit bias and stereotype threat. Providing PIs, postdocs, graduate students and staff with inclusion tools may help mitigate the feelings of isolation in trainees that can undermine their commitment to bioscience careers. Equally important are opportunities for trainees to develop a sense of community. To this end, federal agencies should require that training grant recipients develop opportunities for trainees to interact with other students, postdocs and faculty in informal, nonthreatening settings. These resources also should be adopted in the institutions' classroom settings.

Expand promising programs

Efforts should be made to expand programs that have a demonstrated track record of increasing the diversity of the professoriate. For example, the Institutional Research and Academic Career Development Award program is an initiative of the National Institute of General Medical Sciences that helps postdoctoral scientists to meld research training with pedagogical studies and teaching skills. The program has established partnerships between research-intensive institutions and minority-serving schools and supported a diverse cohort of trainees, more than 50 percent of whom are women and minorities. A large proportion of awardees have matriculated into faculty positions in varied settings including research-intensive institutions, community colleges, primary undergraduate institutions and minority-serving institutions. The endeavor's outcome data provide a compelling rationale to expand from the 20 institutions currently funded and for other National Institutes of Health divisions to adopt the initiative.

Address grant disparities

Donna K. Ginther and colleagues published a paper in Science in 2011 that raised awareness of the disparity between white and underrepresented minority PIs receiving NIH funding. According to Ginther, African Americans were 10 percent less likely to be awarded a grant. While unconscious bias or a need for mentoring in grantsmanship may contribute to these findings, what is clear is that there is an urgent need for tangible initiatives to address this disparity. With the recommendation of its Working Group on the Diversity of the Biomedical Research Workforce, the NIH is in the initial phases of implementing new strategies to address the issue. But

if we want to promote real change, substantive action has to come not only from the NIH but from all members of the STEM workforce, including grant reviewers, other funding agencies and institutions of higher education. For starters, ensuring that grant review panels include underrepresented minorities is likely to contribute to more equity in the review process.

Diversify the professoriate

We need to mandate that university search committees interview collections of candidates that more closely mirror the general population. Increasing the diversity of the professoriate provides successful role models for students and trainees. Having as role models successful mentors with similar backgrounds increases confidence and retention and fosters a supportive environment. While many universities have implemented these practices and increased the percentage of female faculty, search committees should be vetted carefully to generate not only a diverse applicant pool but also a diverse cadre of committee representatives. One additional model would involve programs specifically designed to enhance the number of faculty from underrepresented groups at the rank of full professor and other positions in the upper echelons of academic and government leadership. At this point, the numbers of minorities in leadership positions with training in biochemistry and molecular biology remains low.

Offer career training

Underrepresented minorities disproportionately elect to pursue nonacademic, research-related careers. Offering URMs substantive career training activities and exposure at an earlier stage is likely to create easier transitions during graduate and postgraduate training. Developing federally funded training programs equivalent to IRACDA for trainees interested in science policy, science communication and outreach, and patent law would help to retain trainees and increase the value of the doctoral degree in a STEM discipline. This also would help to dispel the disparaging connotation of "alternative careers" and help to maximize the impact of STEM training in research-related fields.

Assess outcomes

The outcomes of federally funded programs aimed at broadening URM participation need to be assessed rigorously. In-depth analyses that identify best practices for engagement and retention of URMs at all phases of the pipeline would provide key data that could be used to maximize future resource allocations.

Establish networks

It is also important to establish networks of underrepresented minority trainees and faculty that extend beyond the borders of an institution or society. This type of network could be a forum for undergraduate, graduate, postdoctoral and faculty underrepresented scientists and could reduce significantly feelings of isolation. Efforts such as the National Research Mentoring Network are beginning to address this issue by providing a virtual online resource. However, this also could be facilitated through regional networks where underrepresented minority undergraduate and graduate students interact with postdocs and faculty that are navigating diverse biological and biomedical career paths. This type of forum could help to instill self-affirming practices in trainees and enable them to model their success in a supportive network. These networks also would facilitate the exchange of best practices and strategies among programs and build stronger connections between training programs and trainees, particularly with regional minority-serving institutions.

MARION B. SEWER, 1972 – 2016

Shortly before this issue went to press, we learned that the author of this article, Marion B. Sewer, passed away unexpectedly. Sewer, who was just 43 years old at the time of her death, was a professor at the Skaggs School of Pharmacy and Pharmaceutical Sciences at the University of California, San Diego, where she sought to define the mechanisms that control steroid hormone biosynthesis. She also was the deputy chair of the ASBMB Minority Affairs Committee, a co-organizer of the forthcoming annual meeting symposium on nonalcoholic fatty liver disease and a frequent contributor to this magazine. Her passing is a great loss to the ASBMB community.

– The editors

Research spotlight

A Q&A with Lesley-Ann Giddings of Middlebury College

By Andrew Macintyre

Tell us about your current career position.

I am an assistant professor in the department of chemistry and biochemistry at Middlebury College in Middlebury, Vt. Middlebury College is a small, private liberal arts institution with about 2,500 undergraduates. I teach biochemistry, biochemistry laboratory and metabolism. I also dedicate my time to training talented undergraduates interested in biomedical research. My research focuses on exploiting and characterizing secondary metabolic biosynthetic pathways in microbes to identify new broad-spectrum antimicrobial agents.

What are the key experiences and decisions you made that have helped you reach your current position?

Several key experiences have helped me along my journey to my current position. I wanted to become a teacher because I enjoyed tutoring students in science throughout high school and college. I enjoyed helping students improve in a subject in which they were struggling. While I was in graduate school at the Massachusetts Institute of Technology, I explored my interest in teaching science by taking teaching courses and workshops for those considering careers in academia. I also trained a number of undergraduates in the laboratory, which led me seriously to consider pursuing a career at a small undergraduate institution where I could teach and do research with students. As a Smith College alum, I knew the benefits of being taught in small class sizes and having one-on-one interactions with professors. During my postdoctoral training, I also taught at two liberal arts colleges to see if I would like working in an environment that valued teaching just as much as research. Even though striking a balance between teaching and doing research with students can be challenging, I really enjoyed my interactions with undergraduates and later decided to apply for academic jobs at small, private liberal arts colleges.

Lesley-Ann Giddings

How did you first become interested in science?

As a child, I loved watching the show "Ghostwriter" and reading mystery books, such as "The Baby-sitters Club," "Nancy Drew," "The Hardy Boys," and "The Boxcar Children." Initially, I wanted to be a forensic scientist but later realized I would have to be very comfortable with working at crime scenes. In middle school, I developed a strong interest in science and realized that it was one way to understand life's mysteries without having to be at the scene of a gruesome murder. As a result, I continued to excel in my science classes and enrolled in Science Skills Center High School in Brooklyn, N.Y., a high school dedicated to increasing the number of students from underrepresented ethnic groups in science, technology and mathematics.

Were there times when you failed at something you felt was critical to your path? If so, how did you regroup and get back on track?

Yes, there have been numerous occasions during which I failed at something, especially during graduate school. However, looking back on the times when my experiments failed, I learned how to accept that this was what science research was about: re-searching for the answer. I had to learn how to fail in order not to let my disappointment prevent me from moving forward with my science. I try to keep in mind the fact that if the problem were easy, it would have been solved already, and so I can't give up. Every setback has been character building and helped me learn more about the problem as well as learn more about myself. I have to remind myself constantly not to compare my journey to those of others when

things do not go my way. We all have the tendency to think the path to success is linear; however, the path to success has a lot of unintended detours that help us learn important life lessons. I always tell my students that life is all about how you bounce back from disappointment. Are you going to stay down or do something about it? I always push myself to move forward.

What advice would you give to young persons from underrepresented backgrounds who want to pursue a career in science similar to yours?

I think it is important for you to do some soul-searching and identify goals you would like to achieve in the near future as well as five to 10 years down the road. You need to think about what you are passionate about because you need to love what you do to survive the ups and downs in your career. I encourage you to learn to be comfortable with who you are, because a lot of people will try to talk you out of what you want to do in life, including yourself. Most times we don't have the role models we need to make it in the careers we want. Self-doubt is probably the most harmful emotion that can talk you out of your dreams. I urge you to step out of your comfort zone and evaluate what you really have to lose. Oftentimes we realize that we would lose even more if we were not true to ourselves and did not pursue our dreams. Lastly, learn to be OK with failing. This is the hardest thing to learn; however, the faster you learn how to do this, the faster you will move in your research. Sometimes we get so disappointed with the outcome of an experiment that we are slow to make the next step, and we get in the way of our own success.

What are your hobbies?

My hobbies are traveling, relaxing with a good book, spending time with my family, going to the beach, playing Scrabble, going to concerts and listening to music.

What was the last book you read?

The last book I read was "David and Goliath" by Malcolm Gladwell. I love this book because it shows how the underdog can be successful once he fully recognizes his weaknesses and embraces his strengths.

Do you have any heroes, heroines or role models? If so, describe how they have influenced you.

I have been extremely lucky to meet so many people who have had positive impacts on my life. My family, teachers and friends have helped me realize my dream along the way by being supportive of my decisions and helping me find a way to achieve my goals when I thought they were impossible. I surround myself with people who troubleshoot my problems and present me with several solutions. They are my support network/cheerleaders who help me see the possible in the seemingly impossible.

What is it that keeps you working hard and studying science every day?

I love to train students to be critical, independent thinkers and use creative ways to problem solve. I find it extremely gratifying to teach someone a subject and have him or her turn around and show me an even better way of solving a problem in that area of research. I believe this is how educators help scientific ideas evolve, and I am so grateful to be a part of this process. Importantly, I work hard at my science not only to be an outstanding educator, but, together with students, I get to solve mysteries in the laboratory, uncovering the truth about the world while learning something new along the way.

Andrew Macintyre (amacintyre@asbmb.org) is an education and professional development manager at the ASBMB.

PHOTOS COURTESY OF ALLISON KUDLA

Allison Kudla's art melds natural and artificial processes.

Budding artist

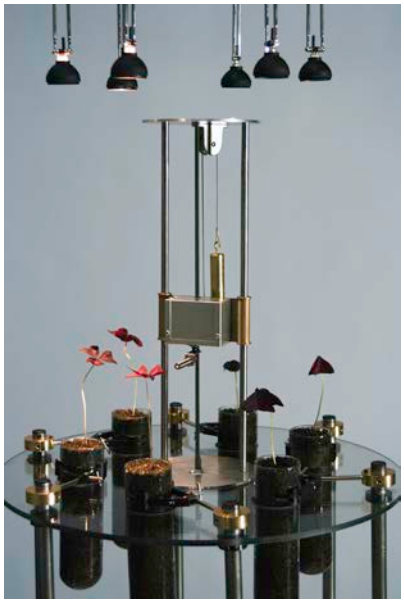
By Alexandra Taylor

Allison Kudla is an installation artist who has been devoted to painting and drawing since she was a teenager. While working toward a Ph.D. in art, an exercise in using computer algorithms to bring still pictures to life led to a revelation. The natural world must have its own algorithms, Kudla thought, parallel "operating systems" that animate life.

Hooked on exploring this concept, Kudla began pursuing projects that create an interplay between natural systems, scientific techniques and futuristic technology. Now it's her calling card. She makes art that blurs the barriers between what's natural and what's artificial.

Blurring barriers

One of Kudla's early projects exploits phototropism, the ability of a plant to orient itself toward or away from a source of light. In "The Search for Luminosity" Kudla employs a collection of phototropic plants to surround a machine containing a light source and a sensor. On first glance, the plants seem to open and close their leaves in relation to available light — the leaves flap open when the light source hovers above them. But Kudla has in fact manipulated each plant in the installation to expect the source at a certain time. When its leaves start to move in anticipation of the light, the machine's sensor notes the movement and sends the source over to bathe the plant in light. Kudla has, in effect, reoriented the sequence that would occur naturally between a plant and the sun by programming the light to intensify in relation to the plant's movements, instead of the other way around.



Oxalis plants interact with light in "The Search for Luminosity"

Wet labs in art school

Kudla describes a National Academy of Sciences conference that she attended recently to which artists and designers had been invited for the first time. "I met a lot of artists who were working on setting up wet labs in their art schools, and I also met scientists who are interested in seeing the creative thinking that artists can bring to problems. With the addition of arts, suddenly things became more focused on what we're doing — larger questions about how human culture is evolving and what we want to do in this world, as opposed to how to incrementally move forward a specific technology."

Kudla earned her doctorate from an innovative program known as Digital Arts and Experimental Media at the University of Washington. During her time at UW, she had many resources at her disposal, including access to lab equipment and a diverse array of scientists, which allowed her to experiment and flourish.

"I didn't have a very validating relationship with science and math when I was younger, and it took approaching those disciplines from an artistic perspective for me to figure out how to find some passion or motivation within those fields," she says.

The arts and sciences both rely on curiosity for invention, and Kudla

feels that a strict allegiance to either field is less important than this shared sense of curiosity. "I think that what should be cultivated is curiosity and the ability to find interest in things and pursue them wherever they lead, from whatever perspective the individual has."

Living systems on display

Kudla's creative unpacking of living systems is on display in her best-known work, "Capacity." For this work, she uses a 3-D printer to create a living fractal with a pattern that mimics both an aerial view of the growth of cities and a microscopic look at the growth of cells. The printer deposits algae and seeds that are contained in a clear gel growth medium into a sealed case. As time passes, the deposited life sprouts, and what should be a still, printed object becomes a living, changing form.

For "Growth Pattern," a more recent work, Kudla uses hormones to stimulate plant leaves to give off new growth, taking advantage of their totipotency. Totipotency is the ability of a plant cell to differentiate into any kind of cell that's needed for the plant's growth. These leaf cells are treated with hormones that allow them to give off new leaf tissue.

First cut into abstract representations of flora, the leaves in "Growth Pattern" are then suspended in square tiles containing water and nutrients. Over time, some of these sterilized tiles are invaded by fungus and bacteria. This process of growth and decay remains on display and is tracked photographically over the course of several weeks.

Working the system

Because all of Kudla's work incorporates live materials, it is impermanent and must be continually set up and broken down. While this quality makes her work unique, it also makes it difficult to support herself through sales. Until recently, Kudla relied on residencies to keep herself afloat.

She recently moved to the Institute for Systems Biology, a nonprofit organization for experimental life sciences research, where she works in their visual design department. The ISB focuses on the idea of consilience — as Kudla puts it, "the merging of disciplines to solve complex problems" — which makes it an appropriate place for someone with her background.

"Systems biology values the integration of biological systems across all scales, from the molecular and cellular to the organism and its environment," she says. "There is an important need to look at those scales and not become fixated on any one aspect of that multiscale system, but look at the interactions in that system."

Kudla is committed to giving artistic perspectives on science a more prominent place at the ISB. She also advocates for alternative modes of education that allow for a more hands-on and creative introduction to science early on.

Kudla believes the arts and sciences have much to learn from one another. "In art, the language of praise for what makes an artwork successful is less clear than it is in science, which allows art to explore realms that could potentially be, not necessarily more innovative, but more creative," she says.

She hopes that her work both will inspire others to follow in her footsteps and will help create more opportunities for people who are talented at merging disciplines.

"If the humanities and technical fields were not so obviously separated," she says, "then perhaps somebody who has a more humanistic perspective on things would learn math or science from their unique perspective and create something entirely unexpected."

A 3-D printer creates a living fractal in "Capacity"

Trimmed leaves under tiles give off new tissue in "Growth Pattern"

Alexandra Taylor (ataylor@asbmb.org) is a staff science writer at ASBMB Today and a master's candidate in science and medical writing at Johns Hopkins University.

Upcoming ASBMB events and deadlines

FEB.

Feb. 11: ASBMB workshop Developing and Sharing Best Practices: From Concept to Classroom, Witchita, Kan.
Feb. 23: Discounted housing closes for the ASBMB 2016 Annual Meeting, San Diego
Feb. 27: ASBMB workshop Developing and Sharing Best Practices: From Concept to Classroom, Westerville, Ohio

MAR.

Mar. 1: Early discounted registration closes for the ASBMB 2016 Annual Meeting, San Diego
Mar. 1 – 4: ASBMB is a sponsor at the Deuel Conference
Mar. 15: Accreditation deadline

APR.

Apr. 2 – 6: ASBMB annual meeting
Apr. 28: ASBMB Hill Day, Washington, D.C.

ASBMB
American Society for Biochemistry and Molecular Biology

Home is where the lab
is, was, will be, my partner
he's home too — elsewhere.

About her haiku, Hingorani says:

"I'm a professor of biochemistry, and my husband is a pharmacologist in the industry. We've lived under the same roof for about seven of our 19 years as a married couple. But it has been a fabulous life, doing what we love and meeting up for a few days/weeks/months at a time in different cities around the U.S. and the world. We wouldn't change a thing."

Manju Hingorani is a professor at Wesleyan University, where her research group studies DNA repair. She is also a program director at the National Science Foundation.

In 2015, Manju Hingorani and her husband of 19 years, Anish Konkar, met up in Helsinki after Hingorani attended a conference in Oslo held in honor of this year's Nobel laureate Tomas Lindahl. They then traveled to St. Petersburg, Russia, and Tallinn, Estonia.

American Society for Biochemistry and Molecular Biology

ACCREDITATION & ASSESSMENT *for* B.S./B.A. PROGRAMS IN BIOCHEMISTRY & MOLECULAR BIOLOGY

The ASBMB has launched a national accreditation program for departments and programs offering baccalaureate degrees in biochemistry, molecular biology and other related degrees. Accredited programs gain access to an independently developed and scored examination for assessing student performance that leads to the conferral of an ASBMB-certified degree.

Programs seeking ASBMB accreditation will be evaluated on criteria such as:

- **Faculty credentials**
- **Support for undergraduate research**
- **Faculty access to professional development programs**
- **Commitment to diversity**
- **Student advising programs**
- **Well-rounded curriculum that includes a robust experiential learning component**

Next application deadline: March 15

For more information, visit www.asbmb.org/accreditation.

ASBMB Accredited Programs Include:

- **Brigham Young University**
- **Miami University (Ohio)**
- **Middle Tennessee State University**
- **Rowan University**
- **Texas A&M University**
- **University of Arizona**
- **University of New Mexico**
- **University of California, Davis**

ASBMB
American Society for Biochemistry and Molecular Biology

Beautiful setting for a cutting-edge symposium

RNA polymerase II coordinates messenger RNA synthesis and processing while navigating the chromatin landscape in eukaryotic cells. Cutting–edge technologies have allowed for an unprecedented view of RNA polymerase II transcription and led to the identification of novel pathways regulating transcription.

In recognition of the central importance of RNA polymerase II and chromatin in gene regulation, cellular development and the pathogenesis of human diseases, the American Society for Biochemistry and Molecular Biology has been hosting a biennial symposium on chromatin and RNA polymerase II since 2004. This year's symposium, titled Transcriptional Regulation: Chromatin and RNA Polymerase II, will take place in October at the Snowbird Ski and Summer Resort near Salt Lake City, Utah. The resort's intimate setting provides extensive opportunities for networking and is about 35 minutes from the Salt Lake City airport.

Attendance at the symposium is capped at 200 principal investigators, postdoctoral fellows, students and scientists from the pharmaceutical and biotechnology industries. Sessions will explore recent findings in RNA polymerase II regulation during the transcription cycle, noncoding RNAs and the contributions of chromatin structure remodeling and covalent histone modifications in mediating gene expression. Ali Shilatifard at the Feinberg School of Medicine at Northwestern University will present a keynote address about enhancer malfunction in cancer.

New this year are travel awards, which will offset some of the attendance costs for trainees. In addition, students and postdoctoral fellows presenting posters will be eligible for poster awards. Winners of the poster awards will give oral presentations in a special session. The status of all submitted abstracts will be posted on the symposium website (www.asbmb.org/ASBMBMeetings/SpecialSymposia/Transcription).

We look forward to seeing you in Snowbird for an exciting and enlightening symposium!

Transcriptional Regulation: Chromatin and RNA Polymerase II

Oct. 6 – 10

Location: Snowbird Ski and Summer Resort, Snowbird, Utah


ARNDT


REESE


TRIEVEL

Organizers: Karen Arndt, University of Pittsburg; Joseph Reese, Pennsylvania State University, and Ray Trievel, University of Michigan

Abstracts for platform presentations deadline: March 1

Early registration and abstract submission deadline for short presentations and posters: Aug. 1

Snowbird Ski and Summer Resort: www.snowbird.com/

Keynote speaker: Ali Shilatifard

New York student members sign up organ donors

By Rosie Wenrich

For 10 consecutive years, Marymount Manhattan College's American Society for Biochemistry and Molecular Biology Student Chapter has held an on-campus event to raise awareness for organ donation and register donors in the state of New York. In an effort to lighten the mood around a topic that can be uncomfortable for some, the chapter holds the event close to Halloween, and the school's biology majors dress as mad scientists. The chapter calls the event Give Us Your Organs, festoons its table with spooky balloons, and gives away gummy body parts, eyeball lollipops and other freebies.

Collaborating with Long Live New York, a branch of the national Donate Life organization, MMC's Student Chapter managed to register 50 new organ donors for the state of New York in 2015.

The chapter focuses on organ donation because of the startling statistics about donation in New York, where the need for transplants far exceeds actual donations. More than 10,000 people in the state are waiting for organ transplants, but, according to Long Live New York, only about 1,000 organs were donated in 2013 (the last year for which statistics are readily available). A single deceased donor can save the lives of up to eight people who are waiting for heart, kidney, lung, pancreas, liver or small intestine transplants. Those who donate tissue can enhance many more lives — by providing corneas for the visually impared, skin grafts for burn victims and heart valves, ligaments and bones for still others.

MMC Student Chapter volunteer Robert Ashley says he finds the event satisfying. "As a volunteer, it was a great experience to be able to educate people who were unsure about exactly what being an organ donor means."

Ashley is also a donor. "It makes us, as individuals, feel better about ourselves by knowing we are willing to donate parts of our body to another individual in need," he says. "Being an organ donor gives us the satisfaction of knowing we are helping save a life or allowing someone who is less fortunate to have a fighting chance."

A senior biology major, Zane Younger, has been a volunteer for three consecutive years. He says, "I believe organ donation is essentially a form of post-mortem philanthropy and benevolence. I enjoy debunking common misconceptions (about) organ donation in the populace of my school."

Patricia Miraflor, another annual volunteer, says, "I feel compelled to volunteer for this event every year because it is fulfilling to see peers willing to save lives or contribute to scientific research."

Each year, the MMC Student Chapter hears from a few students, staff or faculty members whose lives have been touched by organ donation and are moved to see the community contributing to the cause.

Over time, the MMC Student Chapter volunteers have noticed that young prospective donors are more responsive to the topic when engaging in the discussion with their peers rather than faculty members. The volunteers are typically biology students who feel strongly about the benefits of organ donation and are eager to spread awareness.

PHOTOS COURTESY OF ROSIE WENRICH

MMC Student Chapter members (from left) Patricia Miraflor, Emma Kamen, Kaitlin Ross, Alexis Valera and Zane Younger sign up an organ donor.

MMC Student Chapter members (from left) Robert Ashley, Patricia Miraflor, Rosie Wenrich and Elevit Perez work the Give Us Your Organs booth.

In addition to the 50 newly registered donors, the entire MMC community gains exposure to the dialogue regarding organ donation.

This exposure is important. It is apparent to organizers that a vast majority of the MMC community is ill-informed about organ donation. As biology majors, many of whom intend to go to medical school, Student Chapter members feel a responsibility to educate the public on health-related issues, including opportunities for them to make a difference in the medical and research fields.

It is also important to address the ethical concerns associated with organ donation, as ethical issues are integral to the practice of medicine. Making facts clear, such as the fact that organ donation doesn't prevent holding a funeral, can make influence someone's decision to register. Many people also fear organ donation is against their religion or the traditions of their culture. Fact sheets provided by Long Live New York have been found to be effective in clarifying these common misconceptions held by potential donors.

Freshman biology student Kaitlin Ross says, "During my experience of helping with the organ donation table, I learned that there are a substantial amount of people interested in becoming organ donors, but some people do not always understand what being an organ donor entails. I think it is important to hold events like this to raise awareness and to educate people more thoroughly about what it means to be an organ donor."

Student Alexis Valera agrees. "During the organ donor event, many people did not know what it involved but became interested once we handed them fliers and spoke to them. Knowing that donating organs can save lives may further motivate students and faculty of MMC to do so. With the help of the Student Chapter, it would be beneficial to continually educate others and raise awareness about this important cause."

To continue to raise awareness for the cause, the MMC Student Chapter will host a panel discussion this spring featuring organ recipients and family members of organ donors. The chapter received funding and support for these activities from an ASBMB Outreach Grant and is proud to spread awareness for saving lives through organ donation for yet another year.

About Marymount Manhattan College

MMC is a small liberal arts college in New York City with a growing biology program. The biology major consists of 40 to 50 students, allowing for ample one-on-one attention for students and teachers as well as multiple in-house research opportunities. A vital area for student involvement is Marymount Manhattan's ASBMB Student Chapter, which includes the school's Science Society and Pre-Med student clubs. The clubs integrate students with various interests in science, including biology, environmental science and medicine, as well as nonscience majors. All students of these clubs become members of the ASBMB Student Chapter, gaining access to all of the society's resources and involving themselves in outreach activities as well as educational and research opportunities within the college.

Rosie Wenrich (rwenrich@mmm.edu) is a junior biology and sociology major and president of the Science Society at Marymount Manhattan College. She hopes to attend medical school after graduating in 2017.

Why be a science fair judge?

By Geoffrey Hunt

There are a million things that can make you sick: touching a dirty doorknob or, say, sitting next to a coughing neighbor on an airplane. But Janssen Pharmaceutica principal scientist Karen Duffy recently learned about an unexpected, more subtle disease source — neckties. "Here was something that could be harboring bacteria that no one, to my knowledge, had considered a potential spreader of germs before," she says.

SHEILA ROMINE

Judges compare notes at a Delaware Valley Science Fair in Philadelphia.

Duffy didn't have this epiphany reading about necktie research in a scientific journal or seeing it presented at a professional conference. She learned about it while serving as a judge for the Delaware Valley Science Fairs, where bacteria on neck ties was explored in a seventh-grade student's research project.

Such innovative projects are a staple of the thousands of middle- and high-school science fairs that take place annually across the country. Students present their research projects in a variety of science, technology, engineering and math categories, and expert scientists and engineers judge the work. The best projects are chosen to be entered into the Intel International Science and Engineering Fair, where the winning student walks away with $75,000.

While never lacking in enthusiasm, one thing local fairs are in constant need of is judges, especially in the topics of biochemistry and molecular biology. "We need subject matter experts to evaluate the projects," explains Ingrid Weigand, executive director of the Austin Science Education Foundation, which supports the Austin Energy Regional Science Festival.

According to Jon Hicks, a senior associate scientist at Janssen and also a judge for the DVSF, the task of judging is straightforward. "Show up on the day of the fair and provide meaningful, encouraging feedback for students around the projects you are selected to judge," he says.

Duffy adds that the time commitment is "only one day, and it is not a very long day!"

Science fair judges I spoke with are in agreement about the merits of volunteering their time. Duffy says that "the best part is sharing in the excitement of a student who is proudly sharing his or her research." Former Janssen scientist Ray Sweet, who serves on the DVSF board of directors, says he always is "astounded by the maturity, intellect, accomplishment and interest of students of all ages."

The fairs have an added benefit of inspiring the next generation of scientists. Sweet points out that serving as a judge is "about supporting students and being a face-to-face role model for them." Duffy agrees, adding that discussing their research with professionals from different scientific backgrounds challenges the students to think about their experiments in different ways. And, she says, "the judges learn about what types of research excite our future scientists."

By all accounts, serving as a judge comes with a big payoff. Volunteering "is just a rewarding, positive experience all around," says Hicks. For Sweet, the fairs represent something even bigger: "A constant reminder that all is not lost in the world."

Any active scientist is eligible to judge, and, no matter where you live, there is guaranteed to be a fair happening within driving distance. To find a science fair near you, go to www.asbmb.org/Outreach/Map and search for your ZIP code. Questions? Contact us at outreach@asbmb.org.

Student members of an ASBMB Student Chapter can apply to present a $50 judging award on behalf of the society. For more information, visit www.asbmb.org/education/studentchapters/awards/sciencefair/ or contact education@asbmb.org.

Geoffrey Hunt (ghunt@asbmb.org) is ASBMB's outreach manager. Follow him on Twitter at twitter.com/thegeoffhunt.

ASBMB 2016 Annual Meeting

SAN DIEGO

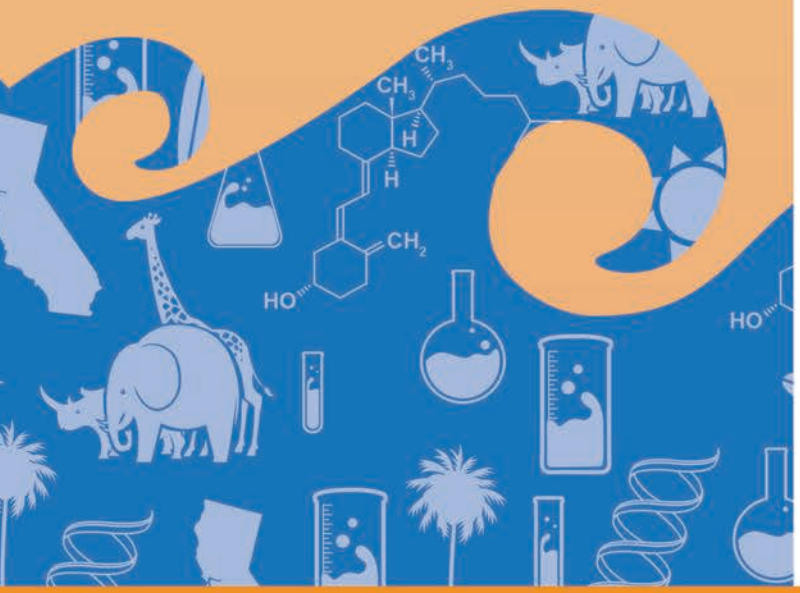
April 2–6

HOUSING DEADLINE:
FEB. 23

DISCOUNTED REGISTRATION DEADLINE: **MARCH 1**
ASBMB MEMBERS SAVE UP TO 56%

ASBMB SPECIAL EVENTS AND WORKSHOPS

- ASBMB Accreditation Workshop
- ASBMB Game Night
- Building Your Outreach Program from A to Z
- Career Development Discussion Sessions
- Developing and Sharing Best Practices: From Concepts to Classroom Workshop
- Incentivizing Great Research
- Straight from the Bench: Graduate and Postdoctoral Event
- Tell Your Science as a Story
- Translational Scientist: Integrating Science and Medicine
- Sickle-Cell Disease Symposium (SEBM)
- Wikipedia Edit-a-Thon



WWW.ASBMB.ORG/MEETING2016

ASBMB
American Society for Biochemistry and Molecular Biology