Medical illustrator puts a soft edge on the hard sciences
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Happy New Year!

From ASBMB Today
Dear readers,

As likely you’ve noticed, ASBMB Today has been given a facelift. The magazine is now in its 13th year of publication, and if you’re a longtime member of the American Society for Biochemistry and Molecular Biology, you’ve witnessed its evolution. For our newer readers, here’s a brief look before I get to what’s in store moving forward.

The magazine’s precursor, ASBMB News, was a 12-page newsletter consisting largely of science policy coverage, member-specific updates and a meetings calendar. Peter Farnham had produced this newsletter for a solid decade when the glossy, full-color magazine you know as ASBMB Today emerged in April 2002, just in time for our annual meeting in New Orleans. John Thompson was the editor who oversaw that redesign. In 2007, the magazine’s look was revamped again, this time under the leadership of Nicole Krege, who then launched the first full-text Web edition in late 2009 — earlier issues had been made available online, but with e-book functionality only. Which brings me to our current redesign and our motivations for it:

**THE LOOK:** We realize that it may take some getting used to, but we hope that the new logo visually underscores our editorial mission to cover biochemistry and molecular biology broadly. Certainly we will continue to report on society activities, but we will be more inclusive in our coverage of issues without ASBMB ties but that affect our readers.

**THE ORGANIZATION:** Now we have three broad categories for content — news, features and perspectives. We will continue to welcome submissions from ASBMB committee members, of course, and we hope that dropping the “departments” moniker will make it clear that, as always has been the case, submissions from all interested readers will be considered for publication.

**THE LOGO:** My hat’s off to our graphic designer, Marnay Harris, who has revolutionized these pages. The work our readers do is of a weighty nature, and Marnay developed a design and color scheme that communicates a true sense of seriousness and professionalism. I also must congratulate our Web editor, Andrew Harmon, and our IT director, Shannon Hall, who hustled to make the online edition harken in many ways to the print edition.

Lastly, thanks to our science writer Rajendrani Mukhopadhyay, ASBMB Publications Director Nancy Rodnan, ASBMB Executive Director Barbara Gordosn and the rest of the Bethesda staffs for their input and support during the redesign. We are delighted by the results, and we hope you are too.

Sincerely,

Angela Hopp
Editor, ASBMB Today

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**Editor’s Note**

The intended and unintended consequences of this dramatic change in practice should be considered carefully before moving forward. I believe the negative consequences are very likely to outweigh any positive ones.

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**By Jeremy Berg**

As 2014 begins, I approach the challenges facing the scientific community with a bit of a renewed sense of optimism. Congress passed a budget agreement that represents a compromise on the competing issues facing our national fiscal system. This lays the foundation for some predictability regarding the framework for appropriations support, but it also offers non-contingent areas for at least a couple of years, although the details regarding funding for science have not yet been determined.

At the same time, other key elements regarding the use of existing resources are under substantial discussion. For example, Congress has been discussing a potential reallocation bill for the National Science Foundation termed the Frontiers in Innovation, Research, Science and Technology, or FIRST, Act (1). In the name of increased transparency and accountability, the FIRST Act draft states that:

Prior to any award of Federal funding described in subsection (a), the Foundation shall publish on its public website a written justification … (of the worthiness for funding) … along with the name of the employee or employees who made the determination and any other information about the research proposal the Director considers appropriate.

As I’ve previously written (2), I feel very strongly about the importance of transparency, but making this information available PRIOR to issuing an award appears potentially quite problematic. The draft bill does not elaborate on this issue, but one possible interpretation is that the goal is to allow public (or congressional) comment about whether a particular proposal is, in fact, suitable for funding prior to the issuance of an award.
When you’re going through hell—keep going
By Benjamin Carb

2013 was, from a legislative standpoint, a year to be forgotten. Legislating from crisis to crisis, sequelsing federal investments in basic research funding and shutting down the government were the hallmarks of the first session of the 113th Congress. With a mere 60 or so bills enacted into law, Congress passed 20 fewer laws than the previous so-called “least effective” Congress back in 1995. However, the year ended with the first bipartisan budget resolution coming out of a divided government since 1986, marking perhaps a slight change in the level of dysfunction. We in the American Society for Biochemistry and Molecular Biology’s public affairs office are hoping so!

As we begin 2014, we see an environment that is rich with potential. Perhaps it’s the eggnog hangover from the holidays, but we are optimistic. Perhaps it’s the desire to put 2013 behind us. Whatever the reason, we are hopeful that the House and Senate will continue to come together and do what is best and brightest for the country. The House has not yet given up the Senate’s reform vision, even though there are those in the House leadership who support reform.

Funding: Of course, funding for basic research will continue to be front and center. The budget deal made in December laid the groundwork to replace some of the funding lost through sequestration, but it is only a short-term deal that doesn’t provide the growth plan a sustainable scientific enterprise needs. The budget deal also provides only short-term relief from sequestration, so we still must work to remove sequestration and the unmanageable budget caps associated with the policy to transition from an austerity-focused to growth-focused budget process.

Immigration Reform: Democrats and Republicans came together in the Senate to pass a bipartisan and comprehensive immigration reform plan that smooths the path for the world’s best and brightest to come to the United States for education and stay for jobs. The House has not yet taken up the Senate’s reform vision, even though there are those in the House leadership who support reform.

We plan to continue to advocate for policies that keep America the global leader in scientific research and innovation. This plan sets the stage for a comprehensive immigration reform policy that would authorize an open exchange of ideas that takes place at meetings. We will continue to fight these restrictions for the sake of keeping government scientists at the forefront of their scientific disciplines.

Promoting Peer Review: Attacks on research grants with funny-sounding titles have been a frequent occurrence in today’s partisan environment. They look to continue into 2014, as the House wants a bill that would politicize science in a way never done before. The peer-review process is not perfect, but it’s the best system we have to ensure that only the most credible science is funded, particularly in these difficult fiscal times.

You can continue to check this column for updates on what the ASBMB is doing related to these policy areas, or you can visit our website at www.asmb.org. You can also e-mail publicaffairs@asmb.org and tell us what you think our legislative priorities should be this year.

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NEWS FROM THE HILL

When you’re going through hell—keep going
By Benjamin Carb

Benjamin Carb (jcarb@braunstein.com) is director of public affairs at ASBMB.
STARTING A SCIENCE ADVOCACY GROUP

By Stephani Page

Scientists today have the opportunity to play a key role in science advocacy. With the current funding climate and the beginning of a new year, now is a better time than ever to start an advocacy group. But how do you do so? I am fortunate to be a member of the University of North Carolina, Chapel Hill, Science Policy Advocacy Group. And I’m here to tell you how to start your own group with the help of the American Society for Biochemistry and Molecular Biology’s public affairs staff!

• Use ASBMB's Advocacy Toolkit website to educate yourself on how to interact with members of Congress: bit.ly/18kUD24.
• Participate in Capitol Hill visits such as ASBMB’s Hill Day: bit.ly/1kmFC3y.
• ASBMB can help you schedule meetings in the local district offices of your members of Congress. Contact Public Affairs Director Benjamin Coh at bco@asbmb.org.
• Attend career talks and webinars provided by professional societies featuring professionals in policy and advocacy.
• Connect the ASBMB’s Facebook (facebook.com/asbmb) and Twitter (twitter.com/asbmb) accounts, voice your opinion on science policy issues and start a social network page about advocacy.

SHARE! One way to bring together a community of like interests is to share your experiences.

Shaaila Kotadia, the ASBMB’s science policy fellow, contributed to this article.

IT STARTS WITH YOU.
Neuroscientist Jean-Pierre Changeux at the Collège de France and the Institut Pasteur in Paris begins his recent “Reflections” article in the *Journal of Biological Chemistry* with a thought about theory in biology: “The identification of common conceptual rules further hinges on the considerable structural and functional diversity of the biological objects,” he writes.

In light of this, his “Reflections” article is a contemplation of allosteric interaction and its effects on the molecular chemistry of proteins “going from bacterial regulatory enzymes up to the nervous system and, tentatively, the higher functions of the brain.”

Changeux’s interest in theory and its role in biology stems from his days as a college student, during which he was exposed to evolutionary biology by inspirational professor Jean Bethellier. The influence of his early research experiences resonates throughout the article. Changeux writes that Bethellier’s teachings and ideas “deeply influenced my scientific career to the extent that until now, as we shall see, my thinking has been framed within the Darwinian evolutionary paradigm.”

Changeux recalls an observation during the early 1960s with the bacterium *Shewanella oneidensis*, the first enzyme of the isoleucine biosynthesis pathway. He notes, “the sensitivity of enzyme preparations to denaturants, resulting in a loss of activity.”

On the basis of these observations, Changeux theorized possible models for the antagonism between L-isoleucine and L-threonine, favoring one in which the substrate and regulatory effector bind topographically distinct sites referred to as allosteric interaction. In 1965, along with fellow researchers Jacques Monod and Jeffrey Wyman, Changeux proposed a concerted model that established a link between the structural organization of regulatory proteins into oligomers and their cooperative properties in signal transduction. This model now is known as the Monod-Wyman-Changeux model.

Changeux writes in his article about two major outcomes of this theory: a paradigmatic shift from the cybernetics of biological systems to the molecular mechanism of signal transduction and catalysis of “empirical research on regulatory proteins using the broad diversity of biophysical methods available.”

Changeux soon tried to extend the MW-C model to acetylcholine esterase, or AChE, fulfilling a desire to bridge allosteric and neuroscience. Then, after isolating the nicotinic receptor nAChR in 1970 and showing its allosteric properties in subsequent years, many other members of what soon became a family of pentameric receptors in the brain were identified including GABAA, GABAC, glycine, 5-HT3 receptors and others.

Allosteric modulation shed new light on neuropharmacology and resulted in discovery of new drugs and drug applications as well. “Without a doubt,” Changeux writes, “the concept of allosteric modulation has created a major landmark in the strategies of drug design for ligand-gated ion channels but also (G-protein-coupled receptors), resulting in the successful development of new classes of drugs used in the clinic.” Some of these drugs include Gleevec (allosteric inhibitor of Abl tyrosine kinase), Cisapride (allosteric activator of calcium-sensing receptor) and Maraviroc (allosteric inhibitor of chemokine receptor 5).

Changeux’s deep interest in the “chemistry of higher organisms” motivated him to further connect molecules with cognition. “Nicotine,” he writes, “exerts reinforcing effects through its action on brain (nAChRs) together with the laying down of long-term traces in the brain.” Experiments in mice provided in vivo data on the role of nAChRs in the mediation of nicotine’s biochemical rewarding effects. Varying allosteric properties in oligomers offered “conformational targets for long-term smoking cessation therapies.”

Changeux ends his “Reflections” article philosophically: “It appears legitimate to say that the future understanding of the mind–brain relationships and the relevant mental processes is likely to rest upon the biochemical world of the allosteric transitions (that) mediate neurotransmissions through multiple levels of organisation spanning the human brain.”
Herb Tabor passes another milestone
By Shirley H. Tan

For those scientists who have submitted their research manuscripts to the *Journal of Biological Chemistry* over the past 50 years (and even those who haven't), Herbert Tabor is nothing less than a living legend.

An investigator at the National Institutes of Diabetes and Digestive and Kidney Diseases, Tabor, now 95 years old, has been on the journal's masthead since 1961. He was first an editorial board member, then an associate editor and then, from 1971 to 2010, the editor in chief. Since 2011, he has served as co-editor.

As if that tenure is not amazing enough, you also should note that Tabor's first JBC paper was published in 1943! And just this past fall, he marked a milestone of sorts by having in 1943, Tabor published his very first article in the JBC, describing the ionization constant of magnesium phosphate (1).

After his medical training, Tabor entered the U.S. Public Health Service and, after a short period as a medical officer on trans-Atlantic convoys, started working closely with Sanford Rosenthal at the National Institutes of Health, where they studied the possible therapeutic use of saline as a replacement for plasma in burns and traumatic shock and investigated electrolyte changes in burns and traumatic shock and studied the possible therapeutic use of saline as a replacement for plasma (2). In an interview with the Chemical Heritage Foundation, sponsored by the American Society for Biochemistry and Molecular Biology in the 1990s, Tabor recalled that the research was potentially very beneficial to U.S. soldiers during World War II because the supply of plasma was extremely limited (3).

Tabor gradually turned his research focus to polyamine biosynthesis, the enzymes and genes involved in regulatory mechanisms, and their important physiological functions. By creating null mutants of *Escherichia coli* and *Saccharomyces cerevisiae* lacking the capability to produce polyamines, Tabor and colleagues were able to study the biological effects of amine deprivation.

We would be remiss to not mention that almost all of Tabor's polyamine work was done in close collaboration with his wife, Celia Tabor was herself a trailblazer and leader: She was the first female intern in internal medicine at the Massachusetts General Hospital in 1944, and she rose to the rank of captain in the U.S. Public Health Service. The couple collaborated for more than 50 years. Celia Tabor died in late 2012.

With regard to the work recently published in the *JBC* (4), Tabor's group was interested in the genes in *E. coli* responsible for glutamate-dependent acid resistance system, or GDAR, and studied in detail the critical importance of polyamines in this system.

Tabor's creativity, diligence and humility undoubtedly make him a role model for young and aspiring scientists. And we know his legend will continue.

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**REFERENCES**


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“All manuscripts submitted to JBC are reviewed and scrutinized carefully, including those from editors and associate editors,” said F. Peter Guengerich of Vanderbilt University, the JBC associate editor who oversaw the review of Tabor’s latest paper. “I was pleased that Herb Tabor’s work reviewed very favorably, and I feel privileged to have been involved in this particular decision. It is truly remarkable to have a career spanning seven decades. Of course, we will be expecting more to come!”

Shirley H. Tan (shirley.tan@gmail.com) is a postdoctoral research fellow at Johns Hopkins School of Medicine.
Unlocking the swinging door
Novel insights into the transport mechanism of the Type II importer MolB,C-A
By Natascha C. Brooks

ATP-binding cassette transporters, also known as ABC transporters, are classified as either importers or exporters and use ATP binding and hydrolysis to control the transport of substrates from the periplasm into the cell. The prokaryotic ABC importers have three conserved components: periplasmic or substrate binding protein, two transmembrane binding domains, and two cytoplasmic nucleotide binding domains. ABC importers can be subcategorized further as type I or II. Much of our understanding of transport mechanisms of type II importers is based on studies conducted with the vitamin B12 transporter, BtuCD-E. In the ATP free state of BtuCD, the outward facing periplasmic gates are open wide to accept substrate from the periplasmic binding protein. ATP binding results in the closure of the cytoplasmic and periplasmic gates, trapping substrate in the periplasmic gate. ATP hydrolysis opens the cytoplasmic gate, allowing molibdate into the cell.

The authors state that the mechanism at the periplasmic gate is “akin to unlocking a swinging door: allowing just enough space for molibdate to slip into the cell.” The authors propose that the conformational changes at the periplasmic gate regulate the transport of small substrates. Future studies will determine if this is a conserved mechanism for the transport of small substrates.

The mitochondrial acetylome
By Donna Kridelbaugh

More than 200 types of post-translational modifications have been discovered within proteomes, creating a complex landscape of protein diversity and function. PTMs alter a protein’s charge or structure in a cellular component.

The mitochondrial acetylome and lysine acetylation in the mitochondria

The researchers used a variety of imaging techniques to show that TgElp3 is localized to the outer mitochondrial membrane, with its C-terminal tail anchored there and the catalytic domain jutting into the cellular cytosol. This orientation suggests the protein may acetylate proteins in the cytosol, on the outer mitochondrial membrane surface, and as they are being transported into the mitochondria (Figure 1). In higher eukaryotes, the elongator complex possesses intrinsic acetyltransferase activity and acts on substrates that include histone H3 and alpha-tubulin, affecting both transcriptional elongation in the nucleus and cell division activities in the cytosol. Mutations in Elp3 and other complex subunits of higher eukaryotes have been implicated in a number of nervous-system and developmental disorders.

Because all other elongator complex subunits appear to be missing in the T. gondii genome, the authors propose that the TgElp3 protein may have evolved initially to function as a general KAT protein for early embryonic development. Although TgElp3 is known to show that higher eukaryotes have evolved initially to function as a general KAT protein for early embryonic development. Although TgElp3 and other complex subunits of higher eukaryotes have been implicated in a number of nervous-system and developmental disorders.

Further evidence for a nonenzymatic mechanism included experiments that show lysine acetylation of both denatured mitochondrial extracts and nonmitochondrial protein and lysine acetylation activity in the presence of CoA, a known inhibitor of acetyltransferases. Lysine acylation in the mitochondria is regulated by the action of the NAD(+)-dependent sirtuins, SIRT3 and SIRT5, which act as deacylases
Two thematic reviews to start the new year

By Mary L. Chang

The January issue of the Journal of Lipid Research features two thematic reviews.

The first is “HDL and cholesterol: life after the divorce?” by Kasey C. Vickers at Vanderbilt University School of Medicine and Alan T. Remaley, an editorial board member at the National Institute of Health’s National Heart, Lung and Blood Institute. This review is part of the continuing thematic series on high-density lipoprotein structure, function and metabolism coordinated by JLR Associate Editor Kerry-Anne Rye of the Centre of Vascular Research in Sydney.

While HDL’s important role in regulating cholesterol levels in the body long has been established, some of its more recently discovered functions involve its capacity to transport proteins, small RNAs, hormones, carotenoids, vitamins and bioactive lipids.

Vickers and Remaley’s review explores the effects of the unique cargo that HDL transports between cells, thanks to its ability to interact with nearly all organs, tissues and cell types in the body and to carry and move fat-soluble molecules.

The other thematic review, “Cytochrome P450-mediated metabolism of vitamin D,” is by Glenville Jones and colleagues at Queen’s University in Canada. It is the latest installment to Editorial Board Member William S. Blair’s thematic series on fat-soluble vitamins.

In their review, Jones et al. discuss the activating and inactivating enzymes of vitamin D metabolism, their biochemical and physiological roles, and their importance in diseases such as kidney disease, psoriasis and cancer.

Included in this review are discussions of CYP2J2A1, the first vitamin D-25-hydroxylase to be cloned in the 1990s; CYP2R1, discovered in 2003 to be the physiologically relevant vitamin D-25-hydroxylase; CYP3A4, a multifunctional nonspecific enzyme estimated to metabolize up to 50 percent of known drugs; 25-hydroxvitamin D-1α-hydroxylase (CYP27B1), whose presence in cells of the colon, breast, prostate, monocyte, macrophage and vasculature may explain why serum vitamin D levels are important to the functioning of these tissues; and 24-hydroxylase (CYP24A1), with its important binding proteins and catabolic enzyme functions.

What happens to muscle as women age?

By Rajendrani Mukhopadhyay

“Little old lady” is a phrase we use in everyday language, but what makes women lose their muscle size and function as they age? In a paper just out in Molecular & Cellular Proteomics, researchers tackled the molecular basis of this phenomenon in humans.

When aging-related muscle loss and function reaches a certain threshold, it gets labeled as a medical condition called sarcopenia. “The overall functional, structural and biochemical alterations in aging muscle have been extensively studied, but the molecular mechanisms involved remain unclear,” explains first author Laëtitia Théron at the French National Institute for Agricultural Research. “So far, studies have been mostly conducted in animal models. There are very few studies in humans.”

The investigators obtained muscle samples from 10 Dutch women undergoing hip surgery. They split the women into two groups. The “mature group” had an average age of 53; the “old group” had an average age of 78.

“We studied postmenopausal women to avoid all hormonal side effects,” notes Théron.

The investigators analyzed the proteins in the muscle samples by liquid chromatography and mass spectrometry, a standard workhorse in proteomics. They identified 35 proteins that seemed to be linked to muscle condition. The proteins, which were expressed at lower quantities in the older women, appeared to fall into two classes: those involved in muscle cell contraction and structure and those involved in energy metabolism. Théron says these proteins could potentially work as biomarkers for sarcopenia.

The investigators are now doing similar experiments in men. They are also working on establishing where the 35 proteins they identified are located inside cells by mass spectrometry imaging. The goal is to see how these proteins form a network.
A special issue of the journal Molecular & Cellular Proteomics in December focused on post-translational modifications. To convey the complexity of the molecular biology and biochemistry involved in these modifications, Jennifer Fairman was recruited to help with the illustrations and schematics as well as to design the cover art of the special issue.

Fairman is a certified medical illustrator who holds a faculty position as an assistant professor at the Johns Hopkins University School of Medicine's Department of Art as Applied to Medicine. At Hopkins, she teaches in the department’s graduate program and does work for other Hopkins medical and science departments. She also runs her own freelance business, Fairman Studios.

As a child

While growing up in Houston, Fairman was fascinated by her teachers. She thought it was amazing “how much teachers knew and how they shared knowledge and contributed to other people’s budding futures,” she says. She hoped to grow up to be a teacher.

Fairman excelled at math and science and attended the Michael E. DeBakey High School for Health Professions. Attending a magnet school like DeBakey opened up the alternate professional career of medicine. But “in the background, there was always art. Art was my hobby, my stress relief,” she says.

When Fairman was 15, her parents relocated the family to Newport News, Va. “I was born and raised in Houston. It was all I knew at that time, so (the move) was the most devastating thing to ever happen to a kid like me!” she says with a laugh.

She attended a regular high school in Newport News, but the guidance counselor knew of her passion for science and math.

One day, the nurses of Riverside Hospital came to speak to students about careers in nursing. “I was invited to go to the library to listen to them. I wasn’t really interested in nursing, but I went anyway because I could get out of German class,” says Fairman. At the library, Fairman sat at the back and began flipping through a booklet the nurses had handed out on health science careers. In flipping through the pages, a picture caught her eye.

“There was this picture of a woman sitting at a drawing table with a skull, a huge picture of an eye and some anatomical drawings around her, and all these different references. She was drawing. I thought, ‘There’s an artist! What is this?’ I wasn’t even reading what it was. I was just looking at the picture. I was so mesmerized,” recalls Fairman. “Then I looked at the title of the career, and it said ‘Medical Illustrator.’”

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After graduation, Fairman moved to Boston to take her first position as a professional medical illustrator at the Lahey Clinic. But 14 months later, the dot-com bubble burst and budget cuts were slated. Lahey’s art department was eliminated. “I was stuck in a new city with a new career and no job. I almost moved back home. But then I decided to wing it,” she says. “As a medical illustrator, if you’re going to be pushed out of an airplane with a good parachute, Boston is a good place to land in because of its medicine and science. There’s a lot going on. It was good to be stuck in a place like that to try my hand at freelancing.” That’s how Fairman Studios got started in 1999.

Fairman became certified and freelanced full time for six years, doing illustrations for patient-education materials, surgical procedures, and medical-device and biotechnology companies. During that time, she got married. But then Hopkins made Fairman an offer to return as a faculty member, so she moved her family to Baltimore. “I always wanted to be a teacher. It came full circle for me to be doing all three of the things that I love: science, art and teaching,” she says. “It’s really amazing how it all worked out.”

Fairman Studios is still running, but because her position at Hopkins is full time, Fairman has limited the time she devotes to freelancing.

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Becoming a medical illustrator

Fairman had never heard of medical illustration. After school, she ran to the public library to look up the profession and found a few books, including one about Max Brödel, who had established the Hopkins department at which Fairman is now a faculty member. She became hooked: Medical illustration was going to allow her to combine her love for science with art.

“I didn’t know how to become a medical illustrator. I just knew it existed,” says Fairman. Her father did the next step for her. He scouted around for programs that offered medical illustration and discovered that Hopkins offered it as a graduate program. He sent away for the undergraduate application, thinking if Fairman did her undergraduate studies there, she would have an easier time getting into the graduate program. On receiving the undergraduate application form, Fairman promptly threw it away. She didn’t think she could get in, and “knowing how small and competitive the field was, I wanted to keep my options open,” she says.

Fairman ended up at the University of Maryland, where she pursued a dual degree in premed biological sciences and studio art. “I couldn’t decide which one to do, so I majored in both!” she says.

After she graduated, Fairman worked at the Systematic Entomology Laboratory at the National Museum of Natural History, which is part of the Smithsonian Institution. After the two-year stint, Fairman enrolled in the Hopkins graduate program.

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Having a good parachute

After graduation, Fairman moved to Boston to take her first position as a professional medical illustrator at the Lahey Clinic. But 14 months later, the dot-com bubble burst and budget cuts were slated. Lahey’s art department was eliminated. “I was stuck in a new city with a new career and no job. I almost moved back home. But then I decided to wing it,” she says. “As a medical illustrator, if you’re going to be pushed out of an airplane with a good parachute, Boston is a good place to land in because of its medicine and science. There’s a lot going on. It was good to be stuck in a place like that to try my hand at freelancing.” That’s how Fairman Studios got started in 1999.

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Having a good parachute

After graduation, Fairman moved to Boston to take her first position as a professional medical illustrator at the Lahey Clinic. But 14 months later, the dot-com bubble burst and budget cuts were slated. Lahey’s art department was eliminated. “I was stuck in a new city with a new career and no job. I almost moved back home. But then I decided to wing it,” she says. “As a medical illustrator, if you’re going to be pushed out of an airplane with a good parachute, Boston is a good place to land in because of its medicine and science. There’s a lot going on. It was good to be stuck in a place like that to try my hand at freelancing.” That’s how Fairman Studios got started in 1999.

Fairman became certified and freelanced full time for six years, doing illustrations for patient-education materials, surgical procedures, and medical-device and biotechnology companies. During that time, she got married. But then Hopkins made Fairman an offer to return as a faculty member, so she moved her family to Baltimore. “I always wanted to be a teacher. It came full circle for me to be doing all three of the things that I love: science, art and teaching,” she says. “It’s really amazing how it all worked out.”

Fairman Studios is still running, but because her position at Hopkins is full time, Fairman has limited the time she devotes to freelancing.

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Life at Hopkins
At Hopkins, Fairman has two primary responsibilities – teaching and producing medical illustrations and animations for other Hopkins departments. She also is involved in administration of the graduate program and sits on the admissions committee. “The one thing that has stayed constant, and what probably drives and fuels me in this field, is that it’s a never-ending education,” she says. “There is always a new technique, a new piece of software or a new scientific discovery that I need to learn about. It’s very hands-on. For every project that I participate in, I become more knowledgeable, better at what I do and more precise.”

When she meets prospective students for the graduate program, she can identify those who haven’t properly researched the field. “They believe that medical illustrators sit at a drawing table all day long and draw pictures with a pencil, which are mostly anatomical,” she says. “It’s not Leonardo da Vinci every day. There are a lot of microscopic things that are being illustrated, where everything is molecular and cellular. I’m seeing that subject matter increase more. Things have become more and more focused and detailed.”

Fairman’s tools, besides the occasional pencil and paper, are Adobe Illustrator and Photoshop. For animations and interactive work, she uses Adobe After Effects and Cinema 4D and programs with HTML5. Keeping up with visualization technology is “like a marathon,” says Fairman. “If there’s one thing I find the most challenging about my job, it is keeping up with the pace of technology, because it’s rapidly changing.”

She says she is privileged to be at an institution like Hopkins, where she can easily keep up with the pace of biomedical research. “There’s a little coffee place which is the Hopkins watering hole,” she says. “There are always posters outside.”

Fairman uses her daily coffee break to peruse those posters and look for seminars that might be important for her to attend. Also, “I learn so much from the assignments that I’m given by reading all the different articles from the assignments that I’m given.”

Fairman also says she stuck to scientific conventions as much as possible in terms of colors and symbols. “For example, thinking back to my time in organic chemistry in undergrad, protein in its correct configuration, acetylation, proteins and organelles, Fairman established a style so that all of the figures throughout the special issue had the same look and feel.”

“Whenever we create any visual, we have to keep in mind who the audience is. Because MCP has a scientific audience, I’ve tried to come up with conventions that people are used to seeing.”

Fairman says it can be a challenge to figure out what should be kept in and left out of an illustration. She had a difficult case with one of the figures from the MCP special issue. “The illustration shows a really complicated mechanism, where there are different proteins on the cell membrane, endoplasmic reticulum, nucleus, all the different organelles, are interacting with each other,” she says. “Instead of showing every single protein in its correct configuration, the best thing to do is to drive home the message is to use color coding. Not worry so much about what those proteins actually look like but focus more on what they do.”

With the cover, Fairman took another tack, because the cover has a different role than figures in the scientific articles. The inspiration for the cover art came from figure 1 in the article by Corina Antal and Alexandra C. Newton at the University of California, San Diego, on the dynamics of lipid second messenger phosphorylation. “The cover isn’t necessarily meant to show the whole mechanism in a way that the readers will completely understand it,” says Fairman. “It is supposed to engage them and bring them into the journal, wanting to read that featured article.”

Creating cover art and illustrations for MCP
The way Fairman worked on the art for the MCP special issue on post-translation modifications was typical for any project she does. She met with Gerald Hart of Johns Hopkins University, the MCP associate editor overseeing the issue, and ASBMB’s publications director, Nancy Rodnan, whose idea it was to hire a professional medical illustrator. Hart explained the science in the various articles. With input from Mary Chang, MCP’s managing editor, the group focused on the images that were either schematics or illustrations. They left alone the images that were captured by a camera or a computer.

“One of the things that I strived to do for this journal was to come up with a consistent style,” explains Fairman. For elements that came up repeatedly, such as ubiquitination, acetylation, proteins and organelles, Fairman established a style so that all of the figures throughout the special issue had the same look and feel. Fairman also says she stuck to scientific conventions as much as possible in terms of colors and symbols. For example, thinking back to my time in organic chemistry in undergrad, in the little molecular model set, oxygen is usually red, carbon is black, and hydrogen is white,” she says.

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Meet Velia Fowler

A new associate editor of the Journal of Biological Chemistry

By Rajendrani Mukhopadhyay

Velia Fowler at The Scripps Research Institute became an associate editor for the Journal of Biological Chemistry in April. Her laboratory focuses on the roles of the actin cytoskeleton in cell architecture and physiology in organs such as muscle, blood and eyes. ASBMB's science writer, Rajendrani Mukhopadhyay, talked with Fowler to learn more about her scientific interests, career and hobbies. The interview has been edited for length and clarity.

Would you briefly explain what your research group is studying and how you got interested in this particular area of research?

I started studying red blood cells as a graduate student and worked out the organization of the actin filaments at the nodes of the spectrin-actin network. I was one of the first people who showed that actin was required to create a two-dimensional network of spectrin underlying the plasma membrane. Later, in my first faculty position at Harvard Medical School, I became interested in how actin polymerization was regulated to create this really complex micro-network of spectrin underlying the organization of the actin filaments. I became interested in how the regulation of actin dynamics affects the structure of the muscle, its contractile function, development and physiology.

We've (also) gone back to red blood cells, where we are studying two problems. One is how actin polymerization is important for spectrin-actin network architecture and the stability of the red blood cell membrane, and the other is how erythroblasts use actin polymerization to expel their nucleus and create the organelle-free mature cell. We study the eye lens, because this family of proteins, the tropomodulins, is highly enriched in the lens fiber cells.

In all of our studies, we study the same molecular mechanisms, but the play-out in cell architecture and physiology is completely different. Our main approach is to use mouse models where we knock out these proteins or overexpress them, followed by a lot of light microscopy to analyze the locations of proteins in cells, the cytoskeletal organization and shape of the cells, and the interactions and functions of the cells. We also do biochemistry. I wouldn't be an associate editor for the JBC if I didn't do biochemistry.

How did you become interested in science?

As a kid growing up, I really liked nature. We were hiking, or walking, in the country. We didn't call it hiking back then. We called it walking! We took walks in the country with my dad on the weekend. We were always out in nature. I was raised to be really curious, so we were always talking about why is this and why is that and how does it work.

My dad was a professor of psychology and early-childhood education. His Ph.D. thesis was actually teaching me as a 2-year-old to read. I was two! He was very enterprising. My mother was a theater director and actor. Actors try to figure out the motivation of a character. It's extremely analytic, dissecting. The actress has a line, but she can't just say the line. She has to have the motivation, the consequences underlying that line, to make it believable. My mother was very analytic.

Did anything occur, in a milestone sort of way, that made you choose science as a career?

I have to say I never made a decision to do research for the rest of my life. I just took one step at a time. I've been doing it now for ages — it's hard for me to believe! All the time, I constantly questioned why I was doing this and thought maybe I should just quit! It's really a tough life. The reward is the intellectual excitement and working with other people.

I went to Oberlin College. It's a very small liberal arts college with an extremely strong science program and lots of opportunities to do independent research. I always took a biology course. After a while, I thought, "I better major in it!" because I had so many credits of biology.

But what really got me into experimental biology was a course at Woods Hole that I took as a junior in the summer. It was called "Experimental Invertebrate Zoology." They don't have that course anymore, but it was an absolutely fantastic course and great experience. When you're at Woods Hole, you go to all these lectures and you're meeting all these graduate students who are really into (science). It's summer camp for scientists! It was so great. That led me to apply to graduate school. I went to graduate school at the Harvard Graduate School of Arts and Sciences.

But there are so many difficulties along the way. I have to say, when I was at Oberlin, I didn't question doing scientific research. It was great. It was such a supportive environment, very collegial, very cooperative learning. Once I got to graduate school, that was the real world, and suddenly it wasn't like that anymore. It was very competitive. I was in a lab where...
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I was the only woman who wasn’t a technician. My adviser would forget to introduce me at small seminars. He would introduce everyone at the table, and he would forget me. There were a lot of hoops to jump through and roadblocks. I always used to say, “They are trying to make me quit. I’m not going to let them make me quit!” I think a lot of men also had issues like that. Growing up, the atmosphere in my family was to figure out why and how did it work. The way I continue to do research is I set a direction but I am open to surprise. I’m very tuned to do research is I set a direction but there is a lot of team science, there’s still your own mind. You’re thinking about which questions to ask and what your experiments mean, and you are alone doing that. But other people are doing it too, so remember that. It’s a difficulty that’s not insurmountable. Also, take some joy in it. It’s so much fun. If you’re not excited about what you’re doing, no one else will be, so what’s the point of that? I also think that there is a myth of how young scientists are supposed to do things. Have these types of presentations, ask these questions, have certain interactions, publish in these journals, and follow X, Y and Z. There’s a lot of expectation and pressure. If you do something that’s not something everyone else is doing, you feel somewhat inadequate and that you’re no good. It is really important not to feel that way or figure out a way to get over it and have faith in yourself. Other people are doing it too, so remember that. It’s your own mind. You’re thinking about which questions to ask and how young scientists are supposed to do things: Have these types of presentations, ask these questions, have certain interactions, publish in these journals, and follow X, Y and Z. There’s a lot of expectation and pressure. If you do something that’s not something everyone else is doing, you feel somewhat inadequate and that you’re no good. It is really important not to feel that way or figure out a way to get over it and have faith in your own goals and what you really like. It takes all kinds of scientists for science to advance.

What do you do outside of the lab? Hobbies?

One of my hobbies is art. I like printmaking and have done wood blocks, etchings, dry points and collographs. My lab does a lot of microscopy, and I’m just fascinated with these symmetrical images. Some of my art is actually taken from images of cells. It’s either an image of something in nature or an abstract image from something my lab might have taken a digital photograph of, but then I’ll make an etching that will take three months to make.

My other main hobby is gardening. I do a lot of gardening. I have a vegetable garden and a native plants garden here in southern California. It takes a lot of time. Before my kids went away, I had kids — and I spent a lot of time with them. I was working with them a lot, doing gardening and art and talking science. Guess what? They are both in science. One of them is in college, and one is in graduate school. We also did a lot of cooking together, with dinner the social point of our day, and it still is when we get together.

For scientists in training, do you have any words of wisdom?

Persistence. There are lots of difficulties, but if you really love doing it, be persistent. Also, remember that you’re not alone. I felt very much alone in many situations. I think it’s better nowadays. There are opportunities for mentoring and networking. We didn’t have any of that 30 years ago. I think it’s better now since students are encouraged to seek each other out and be part of groups with other students or faculty or postdocs. But I still think, at the end of the day, if you’re doing experiments, it’s ultimately a creative process, and that has an element of being solitary. Even though there is a lot of team science, there’s still your own mind. You’re thinking about which questions to ask and what your experiments mean, and you are alone doing that. But other people are doing it too, so remember that. It’s a difficulty that’s not insurmountable. Also, take some joy in it. It’s so much fun. If you’re not excited about what you’re doing, no one else will be, so what’s the point of that?
Is your digital footprint hampering your job search?

By Joseph P. Tiano

Why should we worry about our online personas? Last year more than 80 percent of companies used social media networks for recruiting job applicants, and more than 25 percent of employers rejected job candidates because of something they found about them online. These numbers are on the rise, essentially making our online personas extensions of our cover letters and résumés.

A digital footprint is the data trail left by daily interactions in a digital environment: Facebook, Google+, LinkedIn, Twitter, Pinterest, Instagram, Snapchat and countless others. With so many social-networking sites at our fingertips, it is easy to forget who can view our posts and how long those posts can last. Do you remember what you blogged about five years ago? Those Snapchat pictures that are designed to disappear in under 10 seconds — making them seem safe — can be saved forever even if the recipient takes a screenshot. Long-forgotten blog entries still may appear in Internet searches.

An often-overlooked aspect of social networking is the volatile nature of the data trail. Tweets are powerful tools for instantaneously sharing important news or discoveries, but their ease of use and ability to be retweeted in seconds can be dangerous. The news is full of individuals (businessmen, celebrities and politicians) who tweeted before thinking, and by the time they realized their mistake it was too late. Their tweets already had gone viral.

An often-overlooked aspect of social networking is the volatile nature of privacy settings, which are changing constantly with little notice, making once-private information public.

It is important to evaluate and protect your digital footprints. The simplest way to evaluate your digital footprint is to enter your name into Google or search through www.ppil.com (slightly more in-depth) for potentially damaging pictures or posts.

To be proactive, set up free Google Alerts (www.google.com/alerts) to have e-mails sent to you anytime your name pops up online. Signing up for Google Alerts is easy and takes less than 30 seconds.

For an in-depth evaluation of your digital profile, there are a number of free websites to use. These sites can tell you, for instance, which words you use most frequently, who your connections are, the categories of the Facebook Pages you “like,” whether your relationship to a company or person is derived from your LinkedIn, or Facebook network, and many additional details about your digital footprint.

A few of these websites are the following:

• RepliER.COM: A social-media monitoring service designed to help users manage their online images across different social networks.

• MYWECCAREER.COM: A service that helps you to discover, evaluate and manage online data that may help your career prospects. Supports Facebook, Twitter and LinkedIn.

• SOCIALCLEAN.COM: A service that enables you to monitor and clean your online social profile by analyzing your wall posts, status messages and photos for any ill-advised and inappropriate material that may harm your reputation. Currently supports Facebook only.

• Online profiles are usually overshadowed by cover letters, résumés or CVs, and interviews, and understandably so, but they should not be overlooked. While it is true that an amazing online persona cannot overcome a lack-luster interview, it is equally true that an offensive or embarrassing online persona can jeopardize a great interview. In the current competitive era where highly qualified candidates are competing for a limited number of positions, it is important to demonstrate professionalism on and offline.

Happy New Year! Now, make a resolution to improve your online persona

To protect your digital footprint, evaluate your social networking sites by following the simple steps below. Although they may seem obvious, it is surprising how many people forget or ignore many of them.

• Limit posting while angry, frustrated or under the influence of alcohol.

• Never post anything that you might find embarrassing later.

• Be careful with the pictures you post on your public profiles. Many may be taken out of context and judged wrongly.

• Proofread all posts.

• Change the privacy settings so that only your friends can see your information.

• Defriend, unfollow or block those who pose negative risks to your online footprint.

• Do not post things to bully, hurt, blackmail, insult or affect any kind of harm on others.

• Always keep in mind that once information has been posted online, it can be almost impossible to remove because of archiving and file sharing. Even though you deactivate your accounts, the information may still be retrieved by others.
Understanding faculty salaries

By Charles Brenner

W

ho pays faculty salaries and for how long?

Postdoctoral fellows are typically hired by faculty members on one-year renewable agreements subject to performance and the availability of funds. That’s the definition of soft money. When the grant used to pay the fellow goes away, the position may go away. At many institutions, the longer a fellow is an employee, the more he or she is afforded furlough notice and the right to interview for other positions. However, postdoctoral fellowships are meant to be impermanent training positions and are treated accordingly by human resources departments.

Academic units that hire new faculty members may or may not have long-term plans to fund the positions. Positions with fixed terms are the easiest to understand. They do not exist forever, though they ought to be backed by the funding to pay the faculty member for his or her term. Positions on the tenure track have the greatest variability, which depends on the type of institution and the job description.

A position that is primarily a teaching one is likely to be supported by tuition dollars and offer a nine-month salary. Faculty members may be encouraged or expected to establish independently funded research programs, which bring in summer salary. The nine-month salary is considered hard, i.e., largely guaranteed independently of the type of institution and the job description. A position that is primarily a research one is likely to be supported by research grants, and require the faculty member to commit his or her nine-month salary to research activities. Such situations vary greatly. For example, when a new faculty member is provided with startup funds and there is an expectation to cover a portion of salary from research activities, startup must be used to pay a faculty member’s own salary. Is there a set amount of salary that faculty members must bring in from external sources? Can salary be reduced and, if so, how?

In the days when research-funding paylines were favorable, research-oriented departments were able to use start-up money to pay faculty salaries. This means that the department does not have internal assurance it can pay 100 percent of a new hire’s compensation over the long run. The department has a business plan with assumptions about what percent of salary its members will recover in coming years and potentially when certain people will be ready to retire. In accord with the heightened expectations for funding agencies to pay salaries, soft money job descriptions are increasingly linked to research activities and decreasingly based on teaching. Thus, whereas a college professor might teach two courses in each of two semesters for his or her nine-month salary, a faculty member in a research institute might teach less than a handful of annual lectures and be expected to bring in 90 to 100 percent of his or her 12-month salary.

Offer letters and institutional documents should explain salary-recovery expectations. Such expectations vary greatly. For example, when a new faculty member is provided with startup funds and there is an expectation to cover a portion of salary from research activities, startup must be used to pay a faculty member’s own salary. Is there a set amount of salary that faculty members must bring in from external sources? Can salary be

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Whereas completely hard salaries potentially can encourage some faculty members to stay too long and completely soft salaries provide insufficient security for faculty members to work imaginatively, many institutions are striving to achieve salary policies that provide real job security while allowing faculty members to hold some of the responsibility for salary recovery.

Associates deans for faculty affairs and department chairs who are in touch with peer institutions, such as the Association of Medical and Graduate Departments of Biochemistry, have copies of the salary policies of peer institutions and are privy to discussions of salary policies at their own institutions. Rather than discussing salary with your own chair, get ideas from a chair in another institution and suggest that the associate dean meet with faculty members throughout your college.

I strongly encourage faculty members and prospective faculty members to learn as much as possible about salary policies and to contribute ideas. Because many institutions have linked the size of our salaries to historical salary recovery from the National Institutes of Health, many of us have jobs in departments in which the sum of faculty compensation — should everyone become unfunded — is greater than departmental salary recovery. Just as it behooves academic units to pull together to ensure that every department can afford to pay salaries, it behooves colleagues to develop the most progressive and fiscally responsible policies for faculty salary.
Getting the most out of your student-adviser relationship

By Jenna Hendershott

Schedule the meeting.

Every student-adviser relationship is unique, so maybe a set weekly meeting time will not work with your advisor’s schedule. Early in the mentoring relationship, you should figure out the most efficient way to initiate discussions and share information. With clear communication, you and your advisor should both feel comfortable pointing out areas that could be improved. It takes time and effort from both parties to optimize the relationship for success.

Always allow sufficient time for your meeting, because effective problem solving takes time.

Prepare for the meeting.

Everyone is busy, especially research advisors. When it comes to weekly (or biweekly) meetings, it is important to be proactive. Bring a list of topics to discuss, a summary of your results, a plan for the future. You may run out of time to talk about everything on the list, but you can always follow up with an e-mail to discuss your less crucial questions.

Drive the meeting.

Over the years, I also learned to be specific. What kind of feedback are you looking for? Do you need help interpreting a result, or are you simply sharing a summary? Be direct with your questions. Soon, I was no longer afraid to run the meeting.

Advisors are not mind-readers, so don’t be afraid to ask about a concern you want to attend or a grant you would like to apply for. Ask for whatever you want. Along those lines, be sure to address concerns early.

Clear communication is crucial in any relationship, and you are allowed to state clearly objections or concerns to your advisor. Failing to address problems early can lead to increased frustration. While it’s not always easy to talk about problems, avoid the temptation to deal with issues over e-mail, because face-to-face meetings decrease miscommunication.

Establish benchmarks.

Unlike undergraduate studies, graduate school can be unstructured, and it’s easy to feel lost and overwhelmed. Take notes during the meeting, and be sure to set clear goals.

At first your advisor may feel more like a manager and will tell you exactly what you should do next. Know that your student-adviser relationship will change as you grow into an independent scientist.

It’s important to develop a compatible working style and establish open communication. Before long, your student-adviser relationship will feel more like a peer relationship and you will be well on your way to accomplishing your goals.

STEM women of color: What’s their story?

By Gloria Thomas, Zakiya Wilson and Linette Watkins

While much progress has been made toward reversing the underrepresentation of women and minorities in science, technology, engineering and mathematics fields, women of color, especially African-American, Latina, Native American and Pacific Islander women, remain severely underrepresented, particularly in academia.

However, a number of organizations, conferences and reports are working to elucidate and increase awareness of the unique challenges for scientists at this intersection of race and gender and also to provide appropriate resources and solutions for those needs. This article does not intend to catalog exhaustively all of the recent progress in the community but rather to draw awareness to selected activities and resources occurring at a national scale.

In the National Science Foundation Survey of Doctorate Recipients, published in 2012, women of color made up 2.3 percent of tenure or tenure-track faculty, compared with 12.5 percent of the U.S. population.

While the representation of Asian-American women is more proportional, these women of color do not tend to progress to leadership roles, such as chair or dean.

The findings regarding barriers and obstacles are fairly consistent. For example, the report from the Institute for Women’s Policy Research meeting in May highlights the multifaceted challenges that limit progress, which can be broadly classified as the following: workplace climate issues, unique social challenges, health disparities and family responsibilities; high community service demands, insufficient social support and ongoing discrimination; and limited access to mentoring and social support networks.

The community has sought to address these issues using diverse approaches, including efforts that work toward mentoring, networking and building personal agency; leadership development; and sharing the personal narratives of women of color.

Mentoring, networking and building personal agency

One of the major issues is the chilly climate that women of color experience within academic STEM departments, which often results in systemic microinequities and marginalization that undermine their personal agency.

As one woman shared for this discussion, a mentor once rewrote an entire article that she had produced. None of the ideas was changed, but almost every sentence was rewritten. “If I had not had several other positive and glowing affirmations of my writing ability, this experience could have seriously undercut my confidence in my ability to communicate, which would have been truly detrimental to my career. This instance wasn’t novel or unique to me. I have heard many stories of women of color who have been told verbally, nonverbally, overtly, covertly and subliminally that they aren’t good enough. This blatant untruth is what undermines the progress of women of color. The need to help myself and other women to build personal agency in the face of daunting opposition is what drives me today.”

Another woman shared, “I have been the target of many diversity efforts and well-meaning folks. I have been called ‘a free black hire,’ ‘a trophy,’ and ‘the diversity representa-
tive’ (on a search committee). There’s a constant message that you’re not a competent scientist and you don’t belong here.”

A core component to minimizing the impact of a chilly climate and marginalization is the creation of support structures, such as the American Chemical Society’s Women Chemists of Color program and the newly founded nonprofit Society of STEM Women of Color.

The SSWOC emerged as an outgrowth of the annual STEM Women of Color Conference, which now exists as a catalyst for fully integrating women of color in the STEM fields and helping them own their STEM career identity.

Professional networks like these work synergistically to increase self-efficacy and empower women of color while also serving as credible venues for the dissemination of relevant social-sciences research that focuses on intersectionality and its role in the advancement of women of color in the academic STEM disciplines. Creating community in this way is vital to increasing the success of women of color in the STEM workplace.

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Leadership development

Other approaches focus on leadership development for women of color, who typically have less access to mentors and advocates who can serve as sponsors.

One such national effort is the American Association of Colleges and Universities’ Preparing Critical Faculty for the Future program. Alma Clayton-Pedersen, AAC&U senior scholar, explains: “Our experience in working with more than one-third of HBCUs confirms in real time that STEM women of color faculty have valuable contributions to make to the national effort to increase the number of STEM graduates across all sectors. However, they are often assumed to be the ones to forgo their academic careers to help achieve this goal. The Preparing Critical Faculty for the Future program has been working to address this issue by creating a space for them to network with each other and build on existing leadership and teaching activities to help position them for leadership roles at all levels of the academy.”

Personal narratives

Other efforts focus on understanding the experiences and sharing the personal narratives of women of color in academia (1 – 3).

Each woman has her own story, and exchanging stories with other women of color can alleviate the isolation associated with being the only woman of color in a workplace. It’s powerful to hear that you’re not alone and that others understand and are supportive. As a part of the NSF-supported ACS Women Chemists of Color project, 12 women of color were video interviewed (4). Sharon Haynie at Dupont Central Research, one of the featured women, says, “I firmly believe the stories are instructive.”

Another excellent collection was produced from the proceedings of the Summit for Women of Color Administrators and Faculty in Higher Education hosted by the American Council on Education. It presents narratives drawn from the experiences of women of color in leadership in higher education.

The future

While the work continues, other challenges remain, including making STEM accessible and attractive in K – 12 environments. Novella Bridges of the U.S. Customs and Border Protection (on intergovernmental appointment from Pacific Northwest National Laboratory) had this to say: “We should demystify the fact that STEM fields are hard and only for boys. This needs to be taught often and repeatedly to young girls throughout elementary, middle and high school, so when women get to college they will be ready and excited about STEM and not afraid of it.”

REFERENCES


SHARE YOUR STORY

ASBMB Today will publish in the February issue (and possibly future issues) brief reflections from minority scientists about their heroes and mentors. If you would like to contribute to the collection, please email your narrative of up to 700 words to asmbtoday@asmbmb.org. Submissions received by Jan. 15 will be considered for the print issue. All others will be considered for the online issue. We also welcome print-quality photographs to go with your story.
UV ink, invisible under normal light, was used to spread the plague game’s own benign strain of the disease surreptitiously.

By Mark Rosin

to bring modern science to the 17th century

ASBMB members team with Guerilla Science

The Enlightenment Party

ASBMB members team with Guerilla Science to bring modern science to the 17th century

By Mark Rosin

A nyone who passed by Guerilla Science’s Enlightenment Party in San Francisco this past September would have had reason to look more than once. Costumed revelers stood sipping drinks served by peasants while a five-foot rat slunk seamlessly among them. The rat and dirty peasants were not just your garden-variety instances of city squa-

mate but silent plague carriers.

In the 17th century, the plague ravaged Europe. Cities were deci-

minated and entire families died. Plague doctors visited the infected homes, examining the inmates from behind fearsome masks, and con-

demned the household to quarantine and therefore death.

It was with a lighter spirit that Guerilla Science teamed up with Teaster Baird Jr. and the Ameri-

can Society for Biochemistry and Molecular Biology to give those with a more fortunate place in history a better appreciation for life in the dark ages. Actors and students from San Francisco State University’s ASBMB Undergraduate Affiliate Network chapter donned costumes and charac-

ters as part of an elaborate interactive game to show how the plague could spread, what was known about it then and what is known about it now.

The plague game was the center of Guerilla Science’s huge, costumed Enlightenment Party, a blend of spectacular performances, science and culture. Set in a sumptu-

ous co-living San Francisco mansion known as the Embassy, the party was a chance for members of the public to relive the Age of Reason and discover the unimaginable wonders science reveals to us. Plague doctors, salons, Newton and Descartes, Galileo’s bedroom, the Electric Venus, jugglers and musicians were all featured. Hundreds of people attended the event, many of whom had little experience with science beyond high school and indeed had never met a scientist.

“It was great to see people who had no science background really get into the debates between Descartes and Newton and have fun getting ‘infected’ and ‘treated’… and actually learn some of the microbiology and biochemistry behind it,” said Baird.

Rats, peasants, aristocrats and famous figures from history touched hands, slapped backs and high-fived their way among the guests, transmit-

ting a benign version of the plague with invisible, insidious effectiveness at each instance of physical con-

tact. It was only later in the evening that a plague doctor singled out the infected party-goers for treatment in the party’s dedicated field hospital, showcasing the ease with which this notorious killer spreads.

Way back when, so little was known about the plague that those unlucky enough to have contracted Yersinia pestis would have gotten a chicken around the neck or a dose of arsenic for a cure. Fortunately for party attendees, Baird was on hand to banish ancient superstition and unwrap all those rubber chickens.

Armed with an anarchistic iPad, he shocked partygoers with photos from contemporary outbreaks and explained the basic science behind bacteria. Attendees found out how lucky we are to have antibiotics and Alexander Fleming to combat the plague and put plague doctors out of a job.

By blending the latest findings from biochemical research with art, music and play to create a noisy and colorful interactive experience, the plague game was a unique and effective way to introduce people to a scientific concept in ways the written word or a lecture cannot.

Guerilla Science specializes in scientific events like this. In the six years since we started staging events at music festivals, we have moved beyond simply speaking to our audi-

ces. We engage people’s curiosity with exciting scientific developments by creating interactive and memora-

ble events in unusual and unexpected settings. Our mission is to revolution-

ize how audiences experience science. Our name stems from the way we appear in the places where science and scientists are least expected: nightclubs, historical reenactments, art galleries, cinemas and music festivals.

By embedding ourselves among cabaret dancers, beatboxers, and mud-wrestling pits, we aim to chal-

lenge conventional concepts about science, what it is and how it works. We push boundaries by surprising people with new research (some people in vegeta-

tive states are actually conscious) and big ideas (one day, space tourism could be a common occurrence). We inspire people to consider their own lives in new ways. And through this, we hope more people understand how science provides a window into the complexities of the human condition.

Why does Guerilla Science exist? Simple: “Science is part of our culture, yet often it’s left languish-

ing in the lab or conveyed in dull or patronizing ways,” says co-founder Jenny Wong.

“We are experimental people by nature, who like new and new things. So mixing science, art, music and play (our motto) reflects all of our interests. By bringing these together and collaborating with interesting people with new ideas, you can’t help but think we’ll produce something amazing. People who think in creative ways and succeed in capturing your imagination only make life more exciting.”

The organization’s success grew, in part, out of a realization that tradi-

tional public engagement activities were primarily attracting people already interested in science. To reach new audiences, we had to think about what makes science interesting and relevant to them.

CONTINUED ON PAGE 36
A belated love letter
to my first-grade science teacher

You charged onward when one-third of the class was picking their noses and the girls were busy combing each other’s hair. You knew sooner or later you would correct our attention, because you had a magic show in store for us. Just as it started to look like the day’s curriculum was slipping from your grasp, you seemingly defied the laws of physics when you intercepted a paper plane at midflight and swiftly diverted it into the recycling bin, all in one fluid motion. You then taught us the fundamentals that made such a feat possible.

With mouths agape and pupils dilated, we watched you pace back and forth in front of the chalkboard like a Roman general confident in her battle strategy. You proceeded with an array of examples to help our mushy minds comprehend the revolution happening before our eyes. You blew our minds into a billion pieces and then reconstructed them, and our way of thinking hasn’t been the same since then.

True, your subjects were probably too complicated for our reading level, especially considering that the first-grade science teachers in other schools were dazzling their students with textbooks stacked on a desk like steps to demonstrate that day’s subject: center of gravity. That’s cool enough, but you had a different approach, kind of like Mr. Keating in “Dead Poets Society.” Rather than show us what science was capable of, you taught us what we were capable of when we learned the fundamentals of science.

You gave us the keys to the kingdom. You let us examine the laws of momentum in swings and how gravity provides the fun factor on seesaws. You let us dig in the dirt for arrowheads and told us in a semiwhisper, as if sharing the secrets of the universe, that we held millions of years of history in the palms of our hands. You let us observe the different kinds of clouds that resembled our favorite cartoon characters, teaching us why some looked like Mickey Mouse, while others looked like Peter Pan in flight. By helping us look at our surroundings in a different light, you essentially gave us the world.

With the salary you earned, you didn’t need to go that far or try that hard, but you did, because you believed in us. It is commonly thought that what children absorb early in life affects how they will behave and think when they become older. So as an adult writing this to you many years later, I just wanted to say one last time: Thank you for exposing my mind to the beauty of life rather than corrupting it with negative words.

Michael Mira (notebooknumber-nine@gmail.com) is a freelance journalist, photographer and independent researcher based in Houston. He has traveled extensively, particularly in Southeast Asia and Latin America, researching the effects of economics on public health. He is also passionate about promoting science and math programs outside of the classroom, especially in school districts that receive below-average funding. He writes about technology and environmental sciences for an eclectic range of magazines. Learn more about him at www.notebooknumbernine.wordpress.com.
OPEN CHANNELS

10 resolutions scientists (probably) won’t keep

By Lymor Ringer and Chris Pickett

Every year, people make New Year’s resolutions that they are sure to break by the time February rolls around. In fact, it’s been reported that fewer than 10 percent of New Year’s resolutions actually last. And every year scientists make resolutions that are more than likely to fail. Here is a list of the top 10 doomed New Year’s resolutions:

1. Always wear a lab coat.
   - Lymor’s take: While I was doing my Ph.D., my lab mates and I were scolded by the environmental health folks time and time again for wearing gloves but no lab coats. Yet still I do not make a conscious effort to wear my lab coat while doing experiments but rather use it solely to wear my lab coat while doing experiments.
   - Chris’ take: Sure, wearing a lab coat is safer and good lab practice, for warmth.
   - Lymor’s take: Every scientist has had days when he or she has been in the lab until late in the evening or has been forced to be there all weekend. Sometimes this is inevitable and just the nature of how science experiments go. Other times, it could be avoided by better planning out experiments for the week. Easier said than done, my friends.
   - Chris’ take: This will work so well, and I’ll be so on top of things that I’ll get cocky and decide that I don’t need to write out my plan—I’ll just keep it in my head. Yes, that’s always worked out so well in the past.

2. Stop eating and drinking in the lab.
   - Lymor’s take: Sometimes labs don’t even have a designated place to eat or drink, so what is a hungry or thirsty scientist to do?
   - Chris’ take: Luckily, I have the materials to deliver my coffee by IV drip. Without it, this resolution goes bust in 12 to 16 seconds.

3. Plan ahead.
   - Lymor’s take: By Lymor Ringer and Chris Pickett
   - Chris’ take: But I am genuinely interested in the free food … that should count for something!

4. Read journal club articles ahead of time.
   - Lymor’s take: I’m talking about actually reading them—not just skimming them. I know I could get more out of journal clubs by reading the articles in detail beforehand, but somehow experiments, paper writing and social activities always seem to get in the way.
   - Chris’ take: But I already know the introduction and the results are just a summary of the figures, so I’ll read the abstract, look at the figures and read the discussion. All right, skim the discussion. Fine. Read the last paragraph of the discussion.

5. Attend seminars out of legitimate interest and not just for the free food.
   - Lymor’s take: I’m not sure how lab fridges and freezers get so disorganized so quickly, and I know cleaning them out is a task I always put off for later. And how does the -80 freezer accumulate so much frost? There are few things in life I hate more than chipping ice out of a freezer.
   - Chris’ take: I bet Gregor Mendel had trouble keeping up with his freezers. If he couldn’t keep up with it, what hope is there for me?

6. Stop using Kimwipes as tissues.
   - Lymor’s take: I’m done using Kimwipes just for the free food. Without it, this resolution goes bust in 12 to 16 seconds.
   - Chris’ take: We all know how this one will go. I’ll keep this resolution for two weeks. Then I’ll have to stay late one night, refuse to get out of bed early the next day, and it’s back to the same old schedule.

7. Come into lab early in the morning and leave at a reasonable hour.
   - Lymor’s take: I know plenty of scientists who simply cannot get to lab early in the morning. Many labs look like they’re a dead zone before 10 a.m. Lab work is tiring, so we deserve to sleep in, right?
   - Chris’ take: I actually finish this paper just in time for my PI’s annual iteration/grading-writing session, from which she won’t emerge for another six months. Oh, well. I did my part.

8. Clean out the fridge and/or freezers.
   - Lymor’s take: We’ve all been there. A paper is near completion, and then it just sits on our computer screen as, for some reason, it seems to take forever to actually finish the thing.
   - Chris’ take: I’ll actually finish this paper just in time for my PI’s annual iteration/grading-writing session, from which she won’t emerge for another six months. Oh, well. I did my part.

9. Finally finish that discussion section and submit the paper already.
   - Lymor’s take: I’m attending seminars at New Year’s resolutions. I’m actually getting into the swing of things this year.
   - Chris’ take: I’ll actually finish this paper just in time for my PI’s annual iteration/grading-writing session, from which she won’t emerge for another six months. Oh, well. I did my part.

10. Keep the bench and overall lab clean and organized.
   - Lymor’s take: If only I could be better about doing this on a daily basis; maybe then I could avoid the dreaded lab-cleaning day!
   - Chris’ take: I can do this! Buuut I could use this time to read journal club articles …

And if none of these resolutions gets accomplished in 2014, we can just put them on the list again for 2015. Good luck with all of your New Year’s vows, and here’s to a successful 2014.
The 10 most-read online articles in 2013

1. Great achievements in science and technology in ancient Africa
   Sydella Blatch | Minority Affairs | February 2013

2. How to write a killer cover letter for a postdoctoral application
   Bill Sullivan | Career Insights | October 2013

3. Imposter syndrome: beating the blue-eyed monster
   Bethany Brookshire | Essay | June/July 2013

4. Triple-negative breast cancer: a particularly recalcitrant foe
   Connor Bamford | Feature | April 2013

5. Going M.D./Ph.D. vs. going 100% Ph.D.
   Cody Weston | Career Insights | August 2013

6. I am a Ph.D. student, and I’m a survivor
   Aditi S. Iyengar | Essay | April 2013

7. How to compete with a lab diva
   Donna Kridelbaugh | Career Insights | September 2013

8. “Close to a miracle”
   Rajendrani Mukhopadhyay | Feature | October 2013

9. Where do sperm cells get their energy?
   Rajendrani Mukhopadhyay | Journal News | February 2013

10. How to become a good lab manager
    Elizabeth Sandquist | Career Insights | October 2013

* We know we’re using an imperfect metric (pageviews), as articles published later in the year haven’t had as much time to accrue hits, but we think it is an interesting glimpse at what readers are seeking nonetheless.
2014

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- RNA Processing and Transcription
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- Post-translational Protein Regulation and Modification
- Emerging Roles of Mitochondria in Cell Signaling, Physiology and Disease
- Enzyme Mechanisms & Chemical Biology
- -Omics, Systems Biology and Their Translational Applications
- Membrane Biology
- Frontiers in Glycobiology
- Signal Transduction
- Science of Addiction
- 21st-Century Approaches to Teaching and Communicating Biochemistry and Molecular Biology

Late-Breaking Abstract Deadline: Feb. 21
Early Registration Deadline: Feb. 21
Housing Deadline: March 21

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