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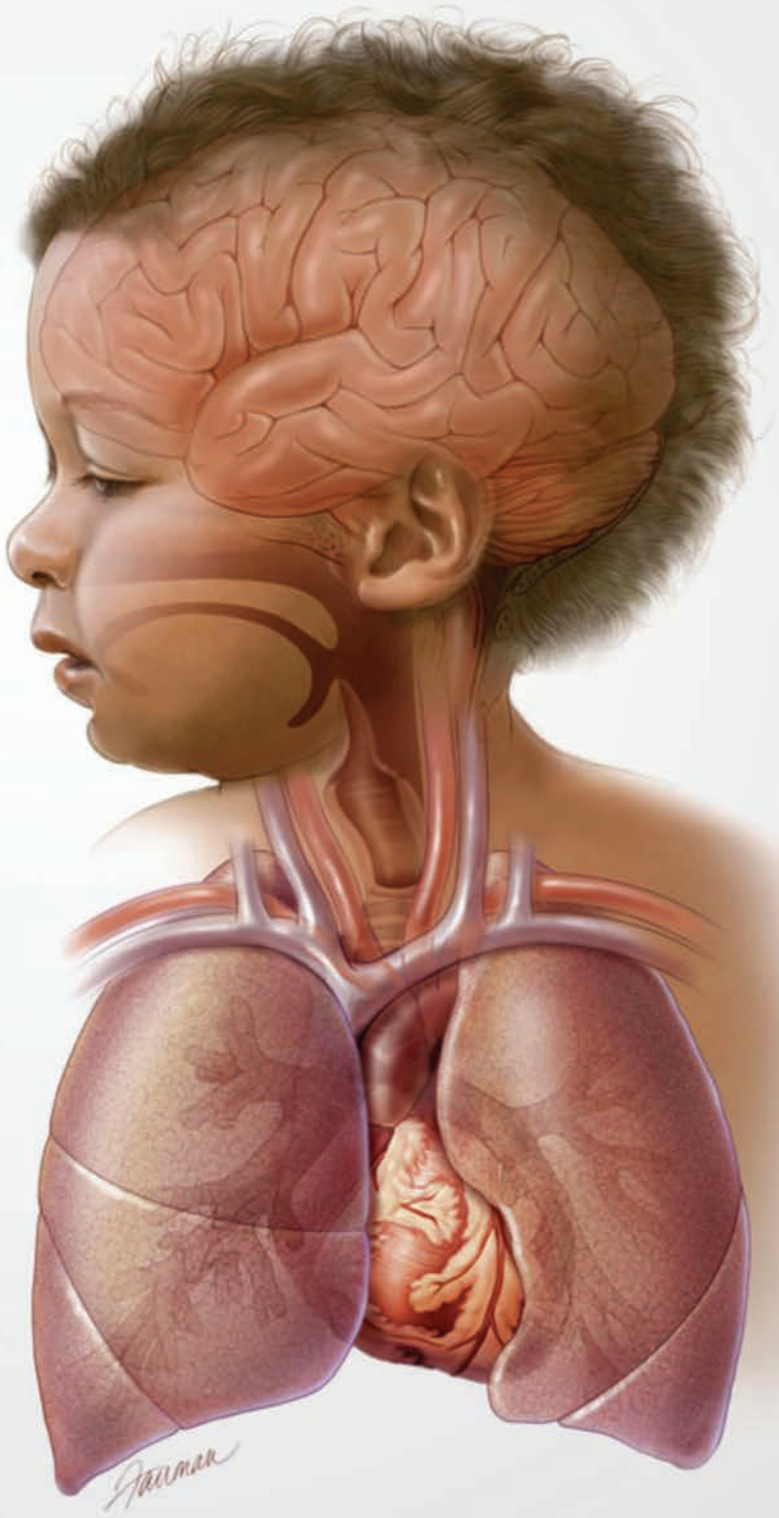
ASBMB TODAY

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



Medical illustrator puts *a soft edge* on the hard sciences

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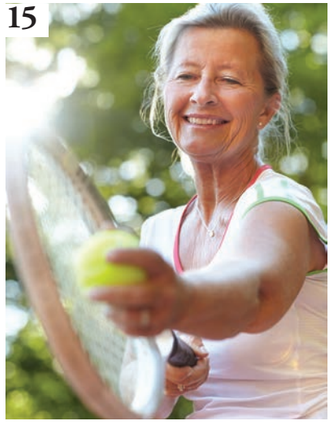

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For our cover story, science writer Rajendrani Mukhopadhyay talked to medical illustrator Jennifer Fairman of the Johns Hopkins University School of Medicine about her career and, more specifically, about her contributions to a special edition of the journal Molecular & Cellular Proteomics.

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

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 back 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 Kresge, who then launched the first full-text Web edition in late 2009 — earlier issues had been made available online, but with flip-book functionality only.

Which brings me to our current redesign and our motivations for it:

THE LOGO: 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 LOOK: 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, many thanks to science writer Rajendrani Mukhopadhyay, ASBMB Publications Director Nancy Rodnan, ASBMB Executive Director Barbara Gordon and the rest of the Bethesda staffers 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

Transparency and the funding decision process

By Jeremy Berg

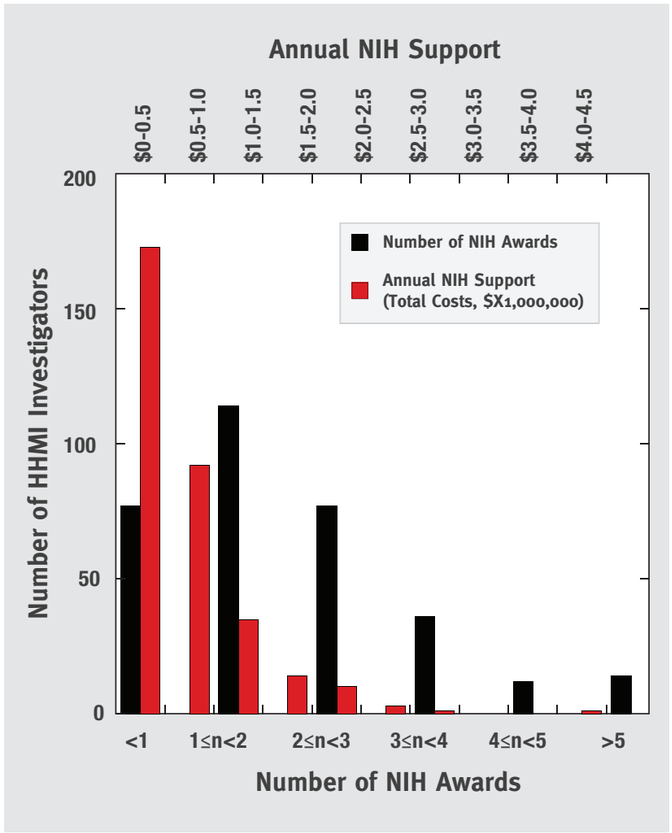
As 2014 begins, I approach the challenges facing the scientific community with a bit of a renewed sense of optimism. Congress passed a budget agreement that represents a compromise on the competing issues facing our national fiscal system. This lays the foundation for some predictability regarding the framework for appropriations supporting science and other important 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 reauthorization 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 have 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. 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.

National Institutes of Health Director Francis S. Collins also



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recently made comments (3, 4) that a discussion is planned regarding the possibility of expanding programs, like the NIH Director's Pioneer Award program, that weigh funding "people, not projects" at an upcoming meeting of the institute and center directors. Collins noted an extensive outcomes evaluation of the Pioneer program (5). The evaluation compared the Pioneer awardees from 2004 to 2006 with several groups, including a group of R01 investigators (approximately matched for level of funding), Pioneer finalists who were not funded and investigators of the Howard Hughes Medical Institute.

A range of bibliometric analyses as well as expert opinion were used as metrics. The report concluded that Pioneer awardees generally outperformed the matched R01 portfolio but that the Pioneer awardees did not outperform the HHMI investigators. The report noted that the Pioneer awards provided less support than HHMI awards and that HHMI provides about $650,000 in direct costs per investigator ("from discussions with HHMI staff and program leadership"). In Collins' comments regarding this issue and the issue of the demographics of the biomedical workforce, he said that "We run a meritocracy and the meritocracy is blind to other things (including the age of the investigator)."

This discussion led me to do an analysis of the level of NIH funding for HHMI investigators. Using data from NIH Reporter (6), I found that more than 80 percent of the 330 investigators had some NIH funding. Of these, all but a few had some R (R01, R21, R03), P01 subproject and research-focused (as opposed to resource-focused) cooperative agreements (U awards) funding.

These investigators average 1.96 awards (dividing an award by the number of principal investigators for multiple-PI grants) and average more than $750,000 in total (direct and indirect) funding (again dividing multiple PI award amounts by the number of investigators). More than 40 percent of the funded HHMI investigators have more than two awards and more than 18 percent have more than three awards.

HHMI supports many outstanding scientists and science. However, I am concerned that the notion that the NIH funding system is a pure meritocracy based on peer-review scores needs more analysis. No one would argue that preliminary results and previous publications are not important factors in receiving a good score on an NIH proposal and having access to substantial amounts of other funding facilitates generating such results.

The National Institute of General Medical Sciences has a long-standing policy (7) regarding issuing awards to well-funded laboratories (defined as laboratories with more than $750,000 in annual direct cost from any source, including HHMI). NIH is piloting a policy (8) for well-funded investigators, defined as those receiving more than $1 million in annual direct costs from NIH (without consideration of funding from other sources). Note that these policies do not represent caps on the amount of support but rather invoke special scrutiny for applications from well-funded investigators. As I have written elsewhere (9), I feel strongly that a special scrutiny, rather than a cap, is the better policy, but only if the analysis is thorough and consequential. NIH is evaluating its policy, but I am skeptical that it will have much impact as constituted.

In the name of increasing transparency about the NIH and how it operates, the author of the valuable blog Medical Writing, Editing & Grantsmanship (10) and I have written a book about the NIH funding process and how best to interact with NIH staff entitled "How the NIH Can Help You Get Funded" (11). In addition to discussing general aspects of the grant-application process, the book describes the NIH and the component institutes and centers and highlights some of the differences in policy and process between these units. In addition, we did obtain some data from nine institutes regarding their R01 funding curves (12). The accessibility of such data as well as clear articulation of the funding decision process for each funding agency is critical for the evaluation of existing policies and the development of new policies for using the resources available to the scientific community to drive scientific progress and impact.

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When you're going through hell – keep going

By Benjamin Corb

2013 was, from a legislative standpoint, a year to be forgotten.

Legislating from crisis to crisis, sequestering 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. Here are some areas that our legislative agenda will emphasize:

• **FUNDING:** Of course, funding for basic research will continue to be front and center. The budget deal 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 research 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 taken up the Senate's reform vision, even though there are those in the House leadership who support reforms. We plan to continue to advocate for policies that keep America the global leader in scientific research and innovation with the hope that an agreement can be reached.

• **GOVERNMENT TRAVEL:** Due in large part to budget constraints, travel for government scientists has been limited. This has led to a decrease in their participation in scientific meetings across the country and world. Low attendance is bad for scientific societies that host meetings, to be sure, but it's quite damaging to the 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.

• **PROTECTING 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 debates 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.asbmb.org. You also can e-mail publicaffairs@asbmb.org and tell us what you think our legislative priorities should be this year.

Benjamin Corb (bcorb@asbmb.org) 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/18qUD24.
- 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 Corb at bcorb@asbmb.org.
- Attend career talks and webinars provided by professional societies featuring professionals in policy and advocacy.

IT STARTS WITH YOU.

BE A VOICE

- Start an e-newsletter or mailing list with important advocacy opportunities and articles provided by the ASBMB Policy Blotter's weekly science roundup: asbmbpolicy.wordpress.com.
- Join the ASBMB's op-ed letter-writing campaign and write to your school's or town's newspapers.
- Connect to 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.

REACH OUT

- Use the ASBMB's advocacy-related websites and social-networking sites to find advocacy groups.
- Ask the ASBMB public affairs staff to connect you with advocacy groups to learn how they started and what kind of programming they do.
- See if any of the ASBMB Public Affairs Advisory Committee faculty members are at your university or a part of your network: bit.ly/IRDViK.

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

Shaila Kotadia, the ASBMB's science policy fellow, contributed to this article.

New fellows at the American Association for the Advancement of Science

EDUCATION

Harold B. White III
Adele J. Wolfson

BIOCHEMISTRY

Paul E. Bock
Alan Richard Brash
Jeffrey L. Brodsky
Dana Carroll
Peter Cherbas
Philip A. Cole
Concetta C. DiRusso
Caroline A. Enns
J. Kevin Foskett
Robert L. Geahlen
Oliver Hankinson
John D. Helmann
Sophien Kamoun
Kevin A. Morano
Richard A. Padgett
James G. Patton
Marcia R. Rosner
Matthew S. Sachs
Tom H. Stevens
Zucai Suo
John J. G. Tesmer
Peter Anthony Weil
Yuan Zhuang

CHEMISTRY

Squire J. Booker
Donald M. Kurtz

MEDICAL SCIENCES

Donald M. Bers
Marc G. Caron
James R. Goldenring
Michael J. Holtzman
Robert J. Lefkowitz
MacRae F. Linton
Mark A. Magnuson
Edward F. Plow
Samuel A. Santoro
Timothy A. Springer
Luke Szweda
David M. Virshup

IN MEMORIAM: Frederick Sanger

SANGER

Frederick Sanger, a Nobel laureate who conducted pioneering research on insulin and DNA sequencing, died in November at the age of 95. Sanger's structural studies led to the determination of insulin's amino acid sequence, which landed him the 1958 Nobel for chemistry. He also developed the rapid "dideoxy" technique to sequence DNA , for which he won the 1980 Nobel in chemistry yet again. Since then, his method has been adapted and is now known as Sanger sequencing. He is the only scientist to have twice won the chemistry Nobel.

IN MEMORIAM: Czeslaw Cierniewski

Czeslaw Cierniewski of the Medical University of Lodz in Poland died in late October at the age of 67. Cierniewki had served as an editorial board member for the Journal of Biological Chemistry since 2003 and had just begun his second term before his death. Cierniewski was a member of the Polish Academy of Sciences.

IN MEMORIAM: Aaron David Freedman

FREEDMAN

Aaron David Freedman, a physician and medical educator who closed out his career in 2008 at the Medical School of the City University of New York, died last year. He was 91. Freedman earned his M.D. in 1945 and then his Ph.D. in 1958. He began his career as a faculty member at Columbia University, then moved to the University of Kansas, served as a department chairman at the Menorah Medical Center in Kansas City, Mo., and then moved to the University of Pennsylvania, where he was a professor and associate dean of the medical school. He later joined the Medical School of the City University, where he served as director of the Goldman Institute for Human Biology from 1975 to 1979, acting dean of the Sophie Davis School of Biomedical Education and vice president for health affairs from 1978 to 1979, and acting deputy dean for academic affairs from 1990 to 1992.

Hannun wins Kuwait Prize

HANNUN

Yusuf Hannun, director of the Stony Brook University Cancer Center, won the Kuwait Prize for basic sciences. Issued by the Kuwait Foundation for the Advancement of Science, the award is bestowed annually in recognition of great scientific accomplishments by Arab scientists. Hannun, a native of Jordan, and his group discovered bioactive sphingolipids, a class of lipids that have emerged as critical regulators of a multitude of cell functions and, when defective, can cause disorders with significant medical effects. Hannun is a past winner of the American Society for Biochemistry and Molecular Biology's Avanti Award in Lipids. In addition to directing the cancer center, he serves as vice dean for cancer medicine and as the Joel Kenny professor of medicine at Stony Brook. The Kuwait Foundation for the Advancement of Science was founded in 1976 and is supported by government and private funding.

Changeux reflects on allosteric interaction, brain chemistry and theories in biology

By Zachary R. Conley

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 Bathellier.

The influence of his early research experiences resonates throughout the article. Changeux writes that Bathellier'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 bacterial enzyme L-threonine deaminase, the first enzyme of the isoleucine biosynthesis pathway. He notes, "the sensitivity of enzyme preparations to the feedback inhibitor L-isoleucine changed with time of storage, purification, heating, exposure to reagents for –SH groups, resulting in a loss of response to L-isoleucine without significant decline of enzymatic activity."

He continues: "Interestingly, the loss of L-isoleucine feedback inhibition was also accompanied by the abolition of the 'bimolecular' kinetics of the enzyme towards its substrate."

IMAGE CREDIT: COLLÈGE DE FRANCE

Jean-Pierre Changeux at the 2009 meeting, Darwin: 200 years, at Collège de France.

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 Jeffries 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 MWC model to acetylcholine esterase, or AChE, fulfilling a desire to bridge allostery 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), Cinacalcet (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 interneuronal communications through multiple levels of organisation spanning the human brain."

Zachary R. Conley (zrconley@live.com) is a freelance science writer based in the Kansas City area.

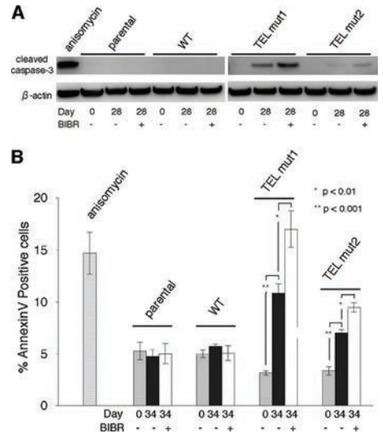
Poking holes in the telomere patch

By Sapeckshita Agrawal

Cancer often is defined loosely as cell division gone awry. For several years, researchers have struggled to find ways to tame this awry cell division while minimizing adversity to normal cells. Radiation, chemotherapy and surgery are conventional methods for ridding the body of cancerous cells, albeit not without harming neighboring bystander cells. Thus, contemporary efforts in cancer research focus on identifying traits that make a cancer cell different from a normal cell and developing precise therapeutics targeted at those traits.

One such trait is the presence of telomerase in a majority of cancer cells. Telomerase, a ribonucleoprotein, synthesizes telomeric DNA (telomeres) during replication. Telomeres are unique complexes of protein and DNA that cap the ends of chromosomes and protect them from abnormal fusion events. However, during each round of replication, some telomere is lost because polymerases are unable to replicate the extreme ends of genomic DNA. This eventually leads to enough erosion of the telomere to cause cells to stop dividing and die off. In cancer cells, however, the presence of the telomerase prevents erosion of telomeric DNA, enabling cells to divide continuously.

Based on this principle, the research group led by Thomas Cech at the University of Colorado is developing strategies to block telomerase activity to engender cancer cell death. The TPP1 protein of the telomere exhibits a patch of amino acids on its surface called the TEL patch. This patch is responsible for recruitment of telomerase to the telomere. In their recent study published in the **Journal of Biological Chemistry**, Cech's team demonstrates that introducing mutations in the TEL patch to disrupt its activity while chemically inhibiting telomerase causes a decrease in proliferation of HeLa cancer cells correlated with a suppression of telomere elongation.



TEL patch mutations induce apoptosis of HeLa cells. A, Western blot analysis probing cleaved caspase-3 (indicative of apoptosis) in TEL mut1 and TEL mut2 cells after 28 days in culture in the absence (-) or presence (+) of BIBR. B, the percentage of annexin V-positive cells (indicative of apoptosis) for the indicated cell lines measured after 34 days in culture. Error bars represent mean ± S.D (n_3; Student's t test; *, p <0.01; **, p<0.001, respectively). The α level for all tests was defined as 0.05. The anisomycin-treated cells served as a positive control for apoptosis.

The group concludes that the pathway for cell death observed in their system is apoptosis as determined by detection of cleavage of the executioner caspase-3 and an increase in annexin V-positive cells in TEL patch mutant cell lines.

The study is significant because it demonstrates the requirement of the TEL patch in cancer cell viability. Based on the findings, telomerase inhibition could serve as a precise therapeutic target. It will be interesting to look out for follow-up studies designed to identify small molecules that inhibit telomerase activity in various cancer cells and assess their efficacy in clinical trials.

Sapeck Agrawal (sapeck.srivastava@gmail.com) recently earned her Ph.D. in molecular microbiology and immunology from the Johns Hopkins University.

From medicine to polyamines

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 Institute 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.

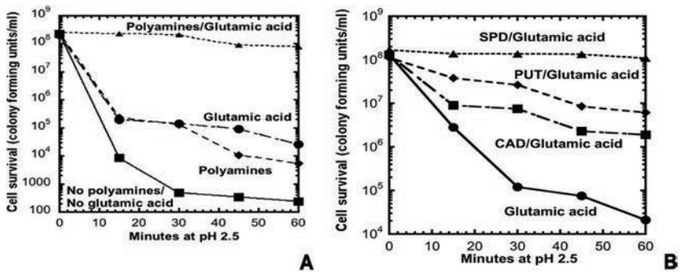
As if that tenure is not amazing enough, you also should note that Tabor's first JBC paper was published in 1943! And just this past fall, he marked a milestone of sorts by having a new paper accepted 70 years after his first. (Though, to his credit, he published many in the interim.)

Tabor's scientific contributions to the fields of pharmacology and biochemistry are substantial. Here is how the legend began. A native of New York City, Tabor completed undergraduate studies in biochemical science and earned his medical degree from Harvard University. While in medical school, he developed a strong interest in biochemistry disciplines under the guidance and encouragement of several of his professors. In 1943, Tabor published his very first article in the JBC, describing the ionization constant of magnesium phosphate (1).

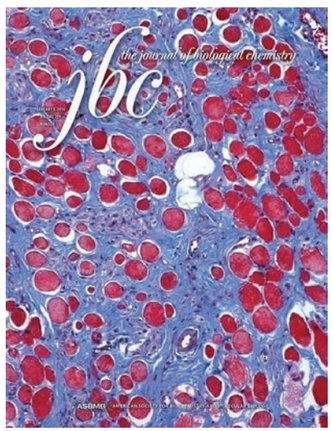
After his medical training, Tabor entered the U.S. Public Health Service and, after a short period as a medical officer on trans-Atlantic convoys, started working closely with Sanford Rosenthal at the National Institutes of Health, where they investigated electrolyte changes in burns and traumatic shock 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 amines, 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



Glutamic acid, polyamines and gadA-gadB are required for acid survival of an E. coli polyamine mutant. (For full description, see reference 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.

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.

GDAR is a critical protective mechanism for the bacteria to survive while passing through the acidic environment of the stomach, and polyamines are a unique protector for E. coli fighting against acid stress, specifically by increasing the synthesis of glutamate decarboxylase.

"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!"

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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Shirley H. Tan (hsuehli.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 $MolB_2C_2$-A

By Natasha 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-F. 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 translocation pathway. Upon ATP hydrolysis, the cytoplasmic gates open, releasing vitamin B12 into the cell. Very little is known regarding the acceptance of small substrates, such as molybdate, from type II importers. The molybdate transporter, $MolB_2C_2$-A, is homologous to BtuCD-F.

In a "Paper of the Week" in **The Journal of Biological Chemistry**, Heather Pinkett at Northwestern University and her collaborators last year proposed the transport mechanism of the importer MolB2C2-A. Through electron paramagnetic resonance spectroscopy and disulfide cross-linking, the authors found that there are distinct differences between the transport of small and large substrates. In the ATP free state, the perplasmic gate is closed while the cytoplasmic gates are opened.

Once ATP is bound, a subtle conformational change occurs in which the perplasmic gate is unlocked and the cytoplasmic gates closed, allowing molybdate into the translocation pathway. ATP hydrolysis opens the cytoplasmic gate, allowing molybdate 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 molybdate 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.

Natasha C. Brooks (nbrooks@shrinenet.org) is the medical staff research services coordinator at Shriners Hospitals for children in Galveston, Texas.

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 way that can affect activity, localization and interactions with other cellular components.

One class of PTMs includes the addition of acyl groups derived from Coenzyme-A pools (e.g., acetyl-CoA and succinyl-CoA) to the epsilon-amino group of lysine residues. Two papers published recently in the **Journal of Biological Chemistry** lend new insights into both enzymatic and nonenzymatic mechanisms for lysine acetylation/acylation of mitochondrial proteins.

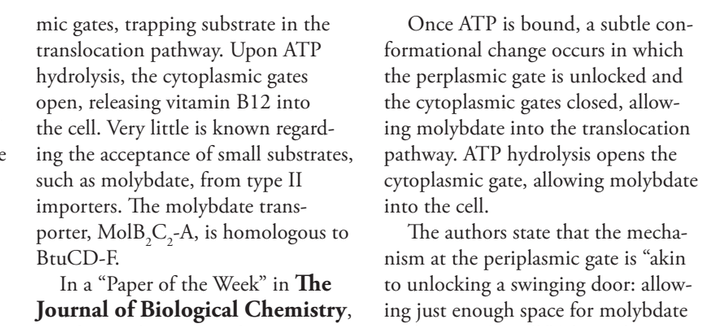

Figure 1: Stilger and Sullivan demonstrate with immunoelectron microscopy that a recombinant Elp3-homologue (black dots) in Toxoplasma gondii localizes to the outer mitochondrial membrane (M), where it may acetylate proteins that are transported into the mitochondria.

Lysine acetylation was first discovered as a mechanism that regulates histone function, but it is now known as a common PTM that is highly conserved across the evolution of prokaryotes and eukaryotes. More recently, succinyl-CoA and other thioester molecules (e.g., malonyl-CoA) also have been found to modify lysine residues, a modification generally referred to as lysine acylation. In the mitochondria, hyperacetylation of metabolic enzymes has been implicated in a number of human illnesses, including diabetes, obesity and cancer, which are related to metabolic syndrome and mitochondrial dysfunction.

While it is known that hyperacetylation is induced by metabolic stress like starvation or from the loss of deacetylase activity, researchers have limited knowledge about the presence of enzymatic lysine acetyltransferases, or KATs, and alternate acetylation pathways within the mitochondria.

In the first JBC paper, Krista L. Stilger and William J. Sullivan Jr. at the Indiana University School of Medicine discovered the presence of an Elp3 homologue, TgElp3 — the catalytic subunit of the elongator complex — in the genome of the single-celled parasite Toxoplasma gondii when searching for potential KAT gene candidates.

They conducted an initial study with recombinant TgElp3 and demonstrated KAT activity in vitro. Based on bioinformatic analyses, the TgElp3 gene and homologous genes from select members of the Apicomplexa phylum are unique in composition, containing a C-terminal transmembrane domain that is missing from other eukaryotic Elp3 proteins.

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).

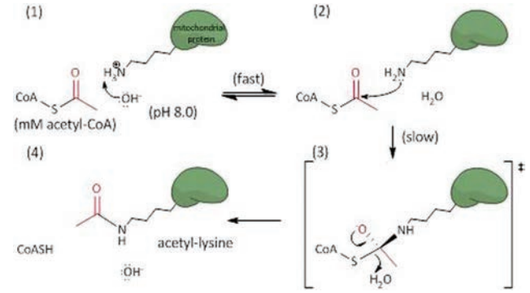

Figure 2: Wagner and Payne propose a base-catalyzed nucleophilic acyl substitution reaction for the nonenzymatic acetylation of lysine in the mitochondrial matrix, which is facilitated by the physiological conditions of the mitochondria (i.e., high pH and acyl-CoA levels).

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-branching eukaryotes. However, some literature also suggests that Elp3 has been detected within the mitochondria of the HeLa human cell line.

Therefore, the researchers also performed a fractionation study with mouse brains and showed evidence that a truncated version of Elp3 protein localizes inside the mitochondria, although the transport mechanism is unknown. Future studies that focus on the role of Elp3 in regulation of the mitochondrial acetylome and identification of its transport mechanism to the mitochondria in higher eukaryotes are needed.

The second JBC paper, which was classified by the journal's editors as a "Paper of the Week," was by Gregory R. Wagner and R. Mark Payne, also of IUSM. Wagner and Payne propose a nonenzymatic mechanism for lysine acylation in the mitochondria based on the chemically catalytic conditions that naturally exist within this organelle (Figure 2).

To test their hypothesis, the researchers simulated mitochondrial conditions in vivo (i.e., elevated pH plus high concentrations of acetyl-CoA or succinyl-CoA) with mouse liver mitochondrial extracts and employed antibody staining to detect acyl-lysine formation. The results clearly demonstrated that both thioesters nonenzymatically modify lysine residues.

Further evidence for a nonenzymatic mechanism included experiments that show lysine acylation of both denatured mitochondrial extracts and a 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

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to remove acetyl and succinyl groups, respectively. In this study, a recombinant SIRT3 was shown to reduce the levels of acetyl-lysine residues on the chemically modified mitochondrial proteins. The researchers propose that SIRT3 and SIRT5 may have evolved exclusively to regulate nonenzymatic lysine acylation in the mitochondria.

These results do not rule out the action of acetyltransferases (or other acyltransferases) in the mitochondria. However, this paper underscores that the physiological role of such enzymes is unclear, because hyperacetylation within the mitochondria leads to detrimental metabolic effects and acetylation events can proceed nonenzymatically.

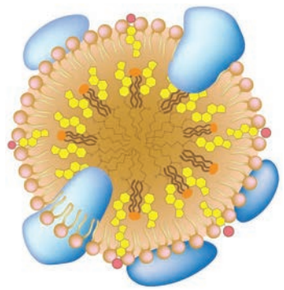
These two studies shed light on a long-standing mystery that has surrounded mitochondrial protein acetylation, offering two mechanisms that are not mutually exclusive. Both enzymatic and nonenzymatic lysine modifications may be taking place at the mitochondria, providing cells multiple options to maintain mitochondrial homeostasis.

Donna Kridelbaugh (@science_mentor) is a science communications consultant and founder of the Science Mentor blog project. She offers a variety of image consulting and marketing services for early career researchers. Learn more at http://sciencementor.wordpress.com.

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. Blaner'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 CYP27A1, 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-hydroxyvitamin 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 protein and catabolic enzyme functions.

Mary L. Chang (mchang@asbmb.org) is publications manager for the Journal of Lipid Research and Molecular & Cellular Proteomics.

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.

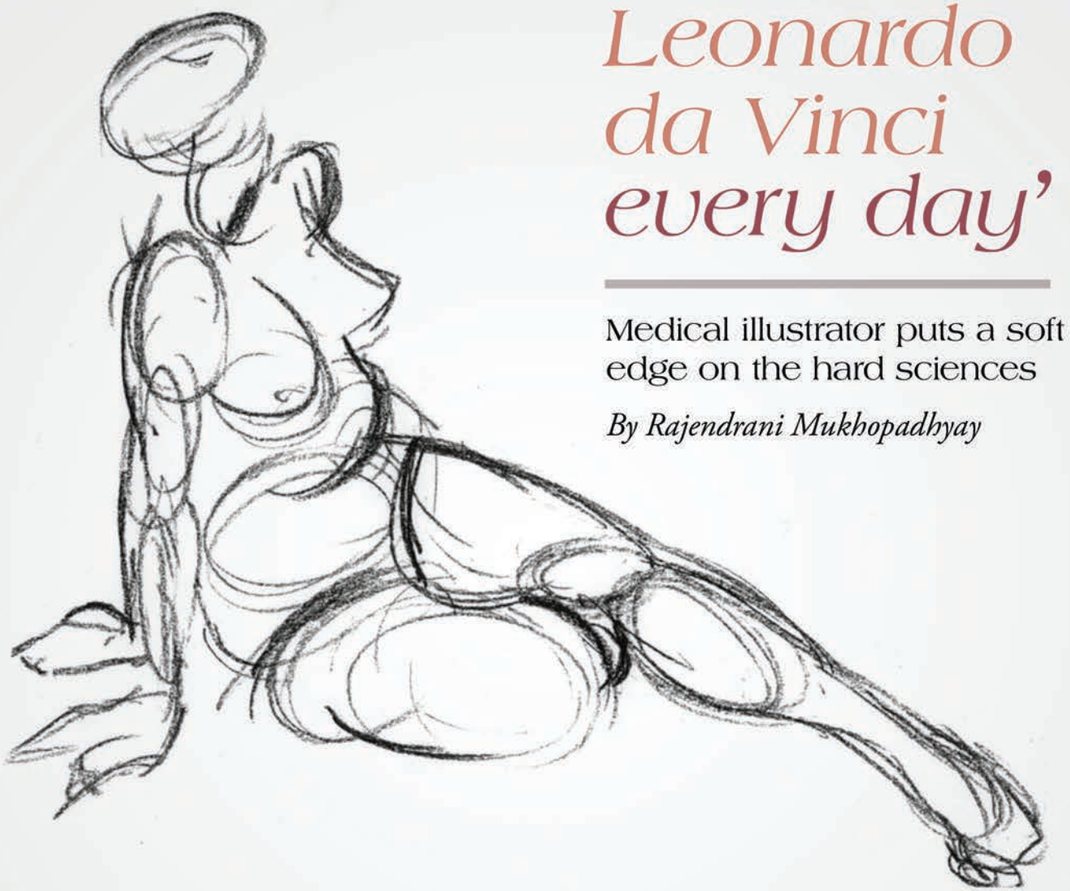
The investigators are now doing similar experiments in men. They are also working on establishing where the 35 proteins they identified are located inside cells by mass spectrometry imaging. The goal is to see how these proteins form a network.

Rajendrani Mukhopadhyay (rmukhopadhyay@asbmb.org) is the senior science writer and blogger for ASBMB. Follow her on Twitter at www.twitter.com/rajmukhop.

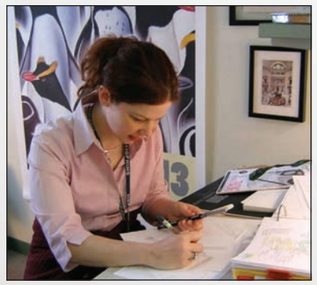
‘It’s not Leonardo da Vinci every day’

Medical illustrator puts a soft edge on the hard sciences

By Rajendrani Mukhopadhyay

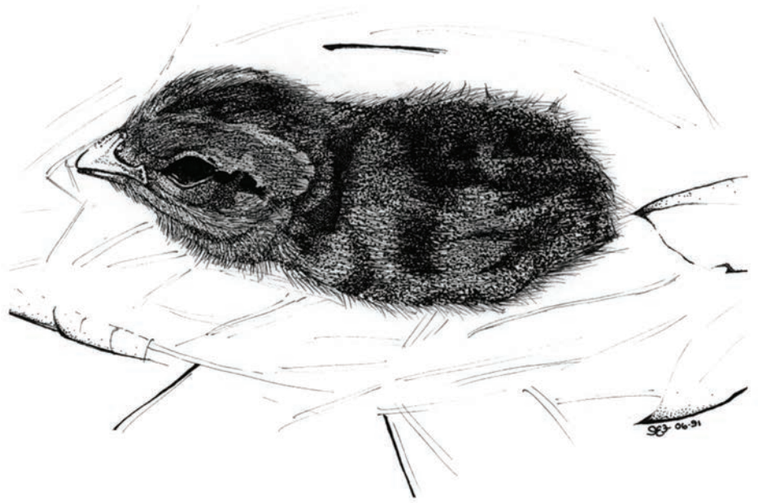


Drawing of the human figure.



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.



Quail chick. Drawing for the Virginia Living Museum newsletter.

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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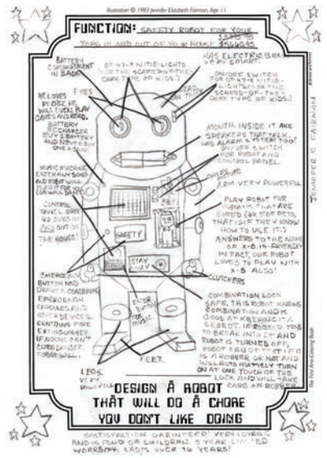

Safety robot. As a child, Fairman loved to draw imaginary creations in her coloring books.

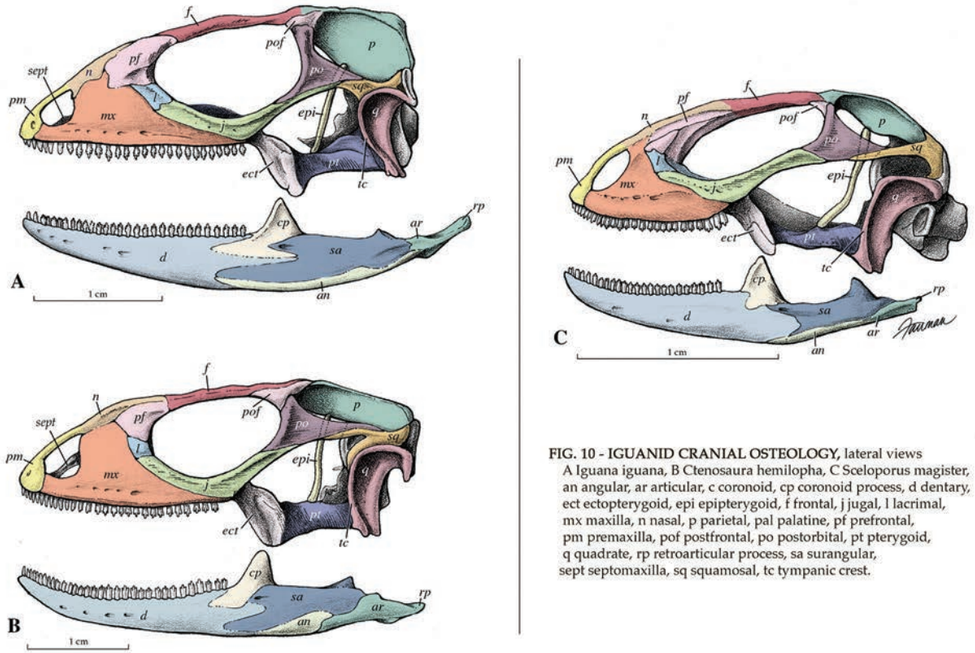

FIG. 10 - IGUANID CRANIAL OSTEOLOGY, lateral views
A Iguana iguana, B Ctenosaura hemilopha, C Sceloporus magister, an angular, ar articular, c coronoid, cp coronoid process, d dentary, ect ectopterygoid, epi epipterygoid, f frontal, j jugal, l lacrimal, mx maxilla, n nasal, p parietal, pal palatine, pf prefrontal, pm premaxilla, pof postfrontal, po postorbital, pt pterygoid, q quadrate, rp retroarticular process, sa surangular, sept septomaxilla, sq squamosal, tc tympanic crest.

Iguanid cranial osteology. As part of her master's thesis, Fairman dissected and illustrated views of 3 iguanian species' cranial bony anatomy. © 1999 JENNIFER E. FAIRMAN

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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.

© 1997 JENNIFER E. FAIRMAN
Depiction of a 17-year cicada (Magicicada septendecim).

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 busted 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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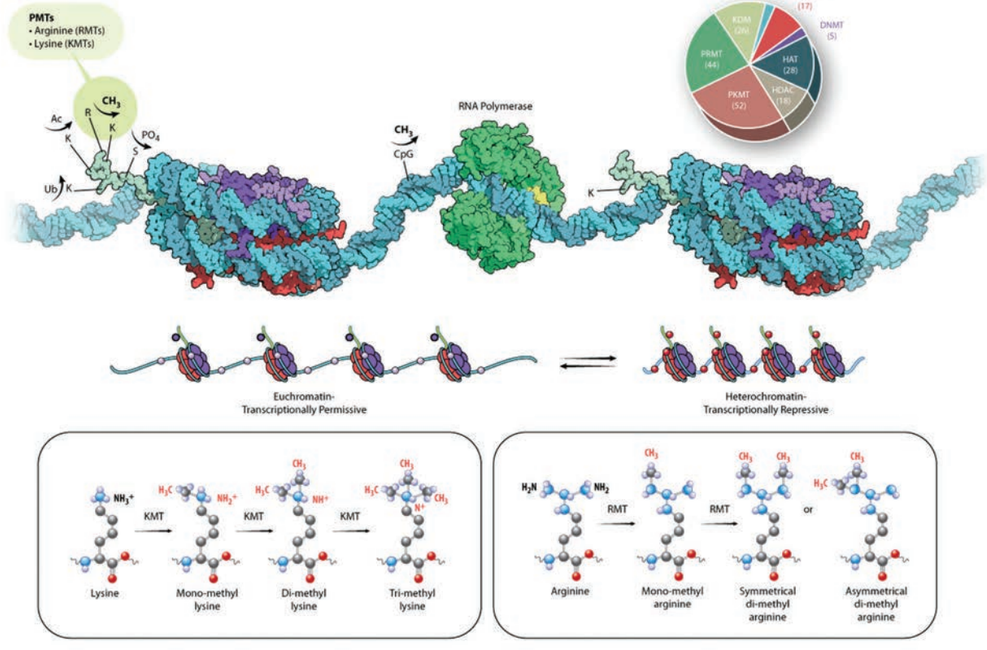
Penguins of the World poster. The penguin portraits reproduced in this poster originally were illustrated as full-habitus images for a permanent exhibit at the Saint Louis Zoo.



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Histone structure. This molecular illustration was created to show chromatin in its relaxed configuration with several key transcription factors, methylation states of lysine and arginine, and a pie chart of the different chromatin-modifying enzyme families.

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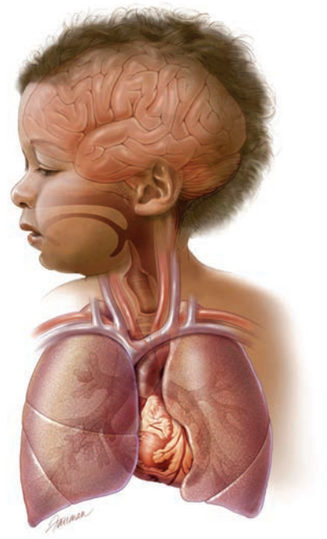

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Systems of pneumococcal infection. The purpose of this illustration was to represent the anatomical systems of the body attacked by S. Pneumoniae, a bacterium that causes various diseases and infections, especially in young children of developing countries.

Life at Hopkins

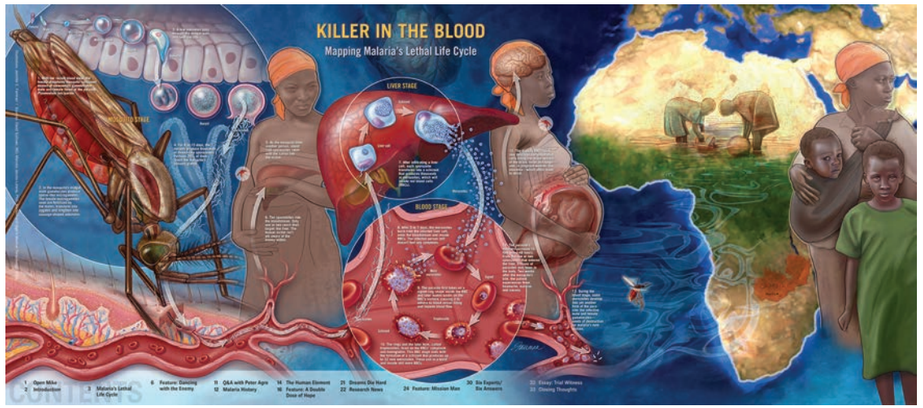
At Hopkins, Fairman has two primary responsibilities – teaching and producing medical illustrations and animations for other Hopkins departments. She also is involved in administration of the graduate program and sits on the admissions committee.

"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 about surgical procedures, molecular mechanisms, actions of drugs," she says. "In addition to being an active member of the Association of Medical Illustrators, that's primarily how I keep up with everything."



Mapping malaria's lethal lifecycle. This three-page spread illustrates the malarial lifecycle caused by Plasmodium falciparum.

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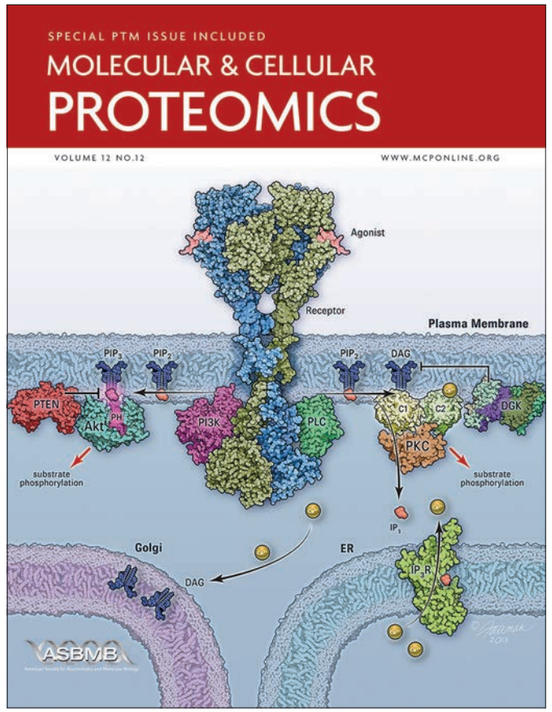
Creating cover art and illustrations for MCP

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. "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 these 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 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."

Rajendrani Mukhopadhyay (rmukhopadhyay@asbmb.org) is the senior science writer and blogger for ASBMB. Follow her on Twitter at www.twitter.com/rajmukhop.

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-architecture. Through that investigation, I discovered a family of proteins called tropomodulins, which regulate actin-filament length and assembly at the slow-growing end of the actin filament.

Once I started working on those proteins, they led me in many new directions. One of the first things we discovered was that tropomodulins are highly enriched in skeletal and cardiac muscle. Now I have a whole effort studying actin-length regulation and assembly in skeletal and cardiac muscle. That has taken on a life of its own. We are basically studying 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 shapes 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 went 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 actress. 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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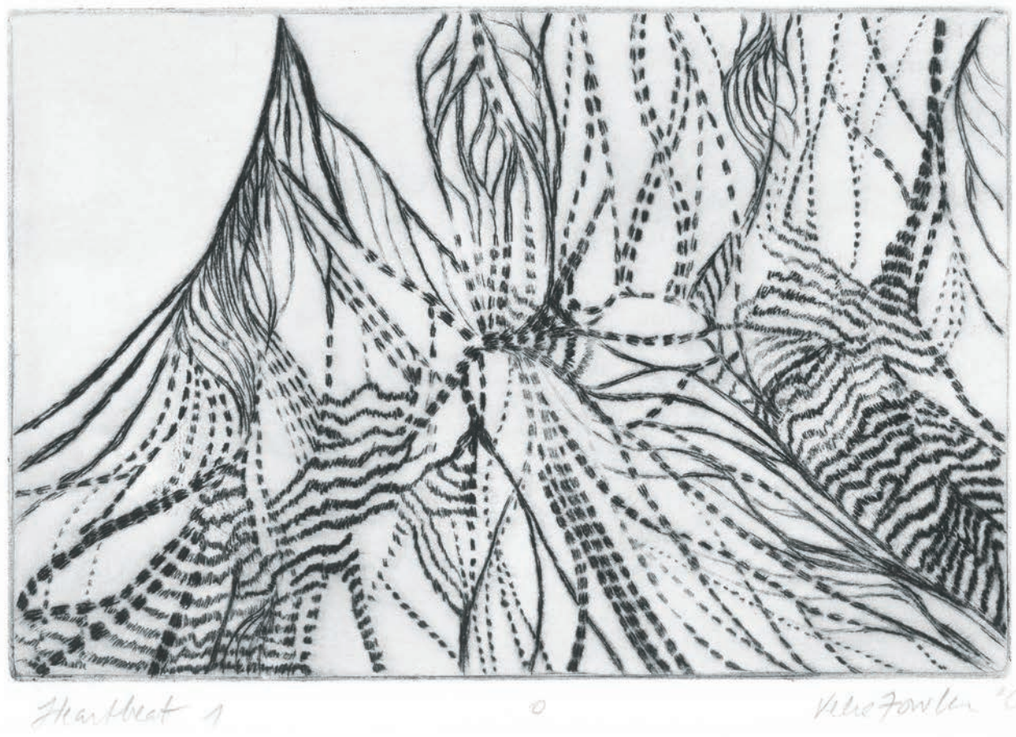

Fowler turned one of her postdoctoral fellow's images, which made it as the cover for the Jan. 5, 2001, issue of the JBC, into a dry point print from a zinc plate.

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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 these, but they were more trained into it or adapted to it.

(But) you heard about my childhood. 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 into fundamental discoveries and basic science. I don't consult. I don't do anything with industry. I'm not in that direction at all. I'm more tuned into education, like trying to inspire other people to learn and discover new things and have that same joy of discovery. I love reading the scientific literature to see all the new things that are being discovered. It's incredible. This doesn't stop.

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 colloprints. 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?

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 your own goals and what you really like. It takes all kinds of scientists for science to advance.

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WEISSMAN

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In forthcoming issues

Keep an eye out for the following interviews by science writer Rajendrani Mukhopadhyay:

- **JONATHAN WEISSMAN** of the University of California, San Francisco, who will be the plenary speaker for the American Society for Biochemistry and Molecular Biology annual meeting in April in San Diego.
- **ROGER COLBRAN** of Vanderbilt University, who became an associate editor for the Journal of Biological Chemistry in September.
- **AMANDA FOSANG** of the University of Melbourne and the Murdoch Childrens Research Institute in Australia, who joined the ranks of the JBC associate editors in September.
- **JOHN DENU** at the University of Wisconsin at Madison, became an associate editor for the Journal of Biological Chemistry in July.

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 during your first year of graduate school? What about high school (for the younger aspiring scientists)?

Your digital footprint is not as secure as you may think. Photos you post to Facebook can be shared without permission. Take a second to think about how well you really know your 300 to 500-plus "friends," and you may be surprised by who has access to your embarrassing pictures from five years ago. Those Snapchat pictures that are designed to disappear in under 10 seconds — making them seem safe — can be saved forever if the recipient takes a screenshot. Long-forgotten blog entries still may appear in Internet searches. 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 our digital footprints. The simplest way to evaluate your digital footprint is to enter your name into Google or search through www.pipl.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:

• **REPPLER.COM:** A social-media monitoring service designed to help users manage their online images across different social networks. Supports Facebook, Twitter and LinkedIn.

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

• **SOCIOCLEAN.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 lackluster interview, it is equally true that an offensive or embarrassing online persona can jeopardize a great interview. In the current competitive era when 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 afflict 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.

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Understanding faculty salaries

By Charles Brenner

The transition from senior postdoctoral fellow to assistant professor is accompanied by one of the most dramatic percentage increases in salary and benefits that many academic scientists ever experience. Compensation is not only greater for faculty members but also softer, more variable and more nuanced than postdoctoral compensation in terms of long-term commitments. Much information on faculty salary and benefits packages is available from university websites. Other information is opaque. Here, we'll try to shed some light on faculty compensation.

Benefits

Professional benefits, typically consisting of a package of health, life and disability insurance and a contribution to retirement, are palpable indications of one's arrival as a faculty member. All of the fine print matters: The institution typically provides an allowance with which individuals choose specific benefits. The retirement contribution is typically of a defined contribution type — the faculty member elects how to invest within the rules of the program. As financial advisers always say, past performance is no guarantee of future returns. It's definitely worth spending a quiet weekend making benefits decisions.

Benefits cost real money. This becomes apparent when faculty members prepare grant budgets that include effort of faculty, trainees and staff. Faculty benefits, being more generous than trainee benefits, cost more: typically about 30 cents for every dollar of faculty salary.

Who 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 offer tenure, 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 by the institution. Funds to pay research staff and summer salary are likely to be the responsibility of the faculty member.

Faculty positions in basic science departments in colleges of medicine, clinical departments in colleges of medicine, and in research institutions are positions for which salary is increasingly soft. However, exceptions abound, and these are not the only types of faculty positions. As positions become softer, the academic units are increasingly leveraged to external funding bodies 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, must startup 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?

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.

In the days when research-funding paylines were favorable, research-oriented departments were able to use startup packages to grow their faculty ranks with little concern about the recurring costs of faculty members. At institutions at which salary recovery is essential for favorable promotion review and little post-tenure salary is guaranteed, academic units do not hold the long-term risk of paying high salaries. In contrast, institutions with strong tenure and no tradition of reducing faculty salary make new appointments and promotions cautiously and increase salaries conservatively.

Messing with Mr. In Between

The extremes of faculty salary arrangements — nine-months hard or totally soft — are relatively easy to understand. A tenured faculty member in a teaching college who does not work in the summer might have complete job security, so long as his or her teaching and service are valued. A tenured or nontenured faculty member at a research institute might receive a 50 percent pay cut if he or she loses two of four grants, each supporting 25 percent of his or her full-time efforts. However, most academic positions are somewhere in between these extremes.

At most institutions, the teaching and service obligations of a department can be redistributed to individuals who have lesser research activities. A potential problem arises when a tenured faculty member who has been given generous raises on the basis of research excellence and external grant recovery becomes more of a full-time educator. Faculty members who teach full time tend to expect a guaranteed salary at a lower scale than that of an investigator who attracts substantial external funding. Will a person at a high salary be able to accept a change in job description and a potential pay cut for long-term security and the financial solvency of the department? Was there any discussion of this when the formerly active researcher was granted tenure?

At Dartmouth Medical School, when I earned tenure, I was told that there was a tenure guarantee of 60 percent salary. However, no one indicated whether my salary could be reduced by 40 percent from its high-water mark or whether salary could be reduced to 60 percent of some other value. Informal discussions suggested that the actual tenure guarantee was quite low. This is not an easy topic of conversation — why would anyone want to discuss with his or her chair or administrator what would happen if he or she lost all grant funding?

Toward greater transparency

Talk about salary and benefits is neither dirty nor inappropriate. If we were to eliminate faculty compensation, only the independently wealthy could afford to be faculty members. 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.

Associate deans for faculty affairs and department chairs who are in touch with their organizations, 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 some ideas from a chair who is visiting or 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 faculties 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 departments can afford to pay. Just as it behooves academic units to pull together to ensure that everyone's grant proposal is as competitive as possible, it behooves colleagues to develop the most progressive and fiscally responsible policies for faculty salary.

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Getting the most out of your student-adviser relationship

By Jenna Hendershot

I knew from the beginning of graduate school that a strong relationship with your research adviser is pivotal to success. However, when I first started my Ph.D., I found myself unprepared for meetings, unsure of what to talk about, and I was nervous that I wasn't going to answer all his questions correctly.

For some reason, I was worried that I would fail some imaginary test and be a huge disappointment. Our meetings were sporadic and usually occurred only when I was really struggling with an experiment.

Over time, we changed our meeting schedule to a more regular pattern. This allowed me to plan and produce agendas with topics to discuss. We exchanged drafts of goals and to-do lists. This made a huge difference in how we interacted and increased the work I was able to complete.

Here are some rules of thumb for getting the most out of your relationship with your adviser.

Make it official.

You should insist on meeting regularly — even if you think you have nothing to talk about. Meeting can help you get around a mental block, and frequent meetings will give you motivation to make meaningful progress. They also help your adviser keep up with your work.

I now share my results as soon as possible, because I then can learn about mistakes early in the process and ensure that I continue to keep my research headed in the right direction.

Schedule the meeting.

Every student-adviser relationship is unique, so maybe a set weekly meeting time will not work with your adviser'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 adviser 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 advisers. 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 list of upcoming deadlines and your 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.

Advisers are not mind-readers, so don't be afraid to ask about a conference you want to attend or a grant you would like to apply for. Ask for what 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 adviser. 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 adviser 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.

Jenna Hendershot (hendeje@umich.edu) earned a B.S. in cellular and molecular biology from Grand Valley State University and is completing her Ph.D. in biological chemistry at the University of Michigan.

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 reworded.

"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 folk. I've been called 'a free black hire,' 'a trophy,' and 'the diversity representative' (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 Conclave, which now exists as a catalyst for fully integrating women of color in the STEM fields and helping them own their STEM career identities.

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-science 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 abilities to help position them for leadership roles at all levels of the academy."

Another is the Opportunities for Underrepresented Scholars fellowship at the Chicago School of Professional Psychology, which offers fellowships for HBCU women faculty members to pursue a specially created postgraduate certificate in academic leadership and is the only program to offer such credentials. Both of these programs focus on STEM women of color at HBCUs, because HBCUs have a disproportionately large percentage of black female faculty members despite the overall low representation of black women in 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."

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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 asbmbtoday@asbmb.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.

On the horizon for the Lipid Research Division

By Vytas A. Bankaitis and Daniel M. Raben

The new year is upon us, and it brings along with it a number of challenges and opportunities. But first, let's recap some of last year.

- In 2013, the Lipid Research Division grew, and we now have more than 400 members.
- The Walter A. Shaw Young Investigator Award in Lipid Research was bestowed upon Mary L. Kraft of the University of Illinois at Urbana–Champaign, making her the fifth recipient of the award.
- The membrane and lipid themes of the American Society for Biochemistry and Molecular Biology annual meeting continue to be successful, and I encourage everyone to register for the 2014 meeting. It promises to exceed our past successes. (The late-breaking abstract submission deadline is Feb. 21.)

With new leadership comes new plans. These initiatives, while ambitious, are aimed at strengthening both our community and our voice within the larger scientific community. To this end, an executive committee will be formed to manage the LRD and to formulate strategies pointed at addressing critical areas.

One key charge of this committee will be to address growing concerns regarding the National Institutes of Health's reviews of lipid-involved proposals. As a first step in that direction, we will provide scientific review officers with the names, email addresses and specific areas of lipid expertise of our members who are both willing and eligible to review NIH proposals that focus on lipid chemistry, biochemistry, biophysics, and the cell biology of lipids and membranes. We anticipate that SROs will use this list to recruit the required number of reviewers with the appropriate expertise to provide fair yet critical reviews of these proposals.

While biochemistry can be defined broadly, it's abundantly clear that our community represents the premiere lipid biochemists.

Obviously, that list has to be generated. To that end, we will reach out to the LRD membership with a survey instrument to collect the required data. The cooperation of each and every eligible member of the lipid community in responding to the upcoming survey will be essential to that enterprise.

New ASBMB President Steven McKnight, a faculty member at the University of Texas Southwestern Medical Center at Dallas, brings an enthusiasm to the ASBMB that inspires great promise. Steve is keenly interested in enhancing the identity of the ASBMB as a home for the leading researchers in biochemistry and molecular biology. The LRD shares this commitment. While biochemistry can be defined broadly, it's abundantly clear that our community represents the premiere lipid biochemists. We will make certain that our input in the ASBMB community remains strong.

While the upcoming year holds numerous opportunities to fortify our community, our continued growth depends on the participation of our members. Renewing ASBMB and LRD memberships and attending the annual meeting in San Diego are examples of such participation. Active involvement of our members in service committees at the LRD, the ASBMB, journal editorial boards and so on also will play a major role in determining how lipid science grows, what directions our field takes and the level of visibility lipid science enjoys.

Yes, the upcoming year presents significant challenges and exciting opportunities. With the lipid community's support, we fully expect to answer the bell.

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The Enlightenment Party

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

By Mark Rosin

Anyone 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 squalor but silent plague carriers.

In the 17th century, the plague ravaged Europe. Cities were decimated and entire families died. Plague doctors visited the infected homes, examining the inmates from behind fearsome masks, and condemned the household to quarantine and therefore death.

It was with a lighter spirit that Guerilla Science teamed up with Teaster Baird Jr. and the American 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 characters 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 period culture. Set in a sumptuous 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.

PHOTOS BY RYAN JOHNSON

UV ink, invisible under normal light, was used to spread the plague game's own benign strain of the disease surreptitiously.

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, transmitting a benign version of the plague with invisible, insidious effectiveness at each instance of physical contact. 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 anachronistic 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.

17th-century astronomer Galileo Galilei (actor Alan McLukie) joins the Enlightenment Party.

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 audiences. We engage people's curiosity with exciting scientific developments by creating interactive and memorable events in unusual and unexpected settings. Our mission is to revolutionize 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 challenge conventions about science, what it is and how it works. We push boundaries by surprising people with new research (some people in vegetative 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 languishing in the lab or conveyed in dull or patronizing ways," says co-founder Jenny Wong.

"We are experimental people by nature, who like new trying 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 traditional 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.

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Teaster Baird, who played a scientist from the future, introduces revelers to the basic science behind bacteria and toxins.

What caused the plague was so poorly understood in the Enlightenment that plague doctors, as played by actress Katie Dahlson, prescribed arsenic to victims of the disease.

Hundreds of partygoers, many with no background in science, talked with scientists and engaged with big ideas from science and history.

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We believe that the future of science engagement is one in which scientists and educators add to their unique and valuable skills the skills of performers, artists and designers. It is only by supporting new, innovative projects like the Enlightenment Party that science engagement can progress. Although many scientists already have left the ivory tower, learning to walk outside it is another matter.

Mark Rosin is a Ph.D. physicist at the University of California, Los Angeles, and co-founder of Guerilla Science. Visit www.guerillascience.co.uk and on Facebook or Twitter to find out more.

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 corral 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 what 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 (notebooknumbernine@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.

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 for warmth.

Chris' take: Sure, wearing a lab coat is safer and good lab practice, but who will see my entire ensemble of decoratively bleach-stained clothing?

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: 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.

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: But I am genuinely interested in the free food … that should count for something!

Chris' take: I always attend seminars out of a legitimate interest in the science. I believe the science … wait … I smell Chinese food. And there's pizza across campus. I can get both if I leave now.

6. Stop using Kimwipes as tissues.

Lymor's take: Wait, are they not tissues?

Chris' take: Yeah, right. And I'm supposed to stop wearing bench pads as underwear too? Let's get realistic here.

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: 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.

8. Clean out the fridge and/or freezers.

Lymor's take: I'm not sure how lab fridges and freezers get so disorganized so quickly, but 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. And if he couldn't keep up with it, what hope is there for me?

9. Finally finish that discussion section and submit the paper already.

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 hibernation/grant-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! Buuuut 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.

Lymor Ringer earned a Ph.D. in tumor biology from Georgetown University. She is a postdoctoral fellow at Johns Hopkins University. Chris Pickett (cpickett@asbmb.org) is the ASBMB's senior science policy fellow.

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's an interesting glimpse at what readers are seeking nonetheless.*

2014 ASBMB ANNUAL MEETING

April 26–30, 2014 • San Diego, CA

ASBMB THEMATIC SESSIONS:

- Lipids; From Biology to Physiology
- DNA Replication, Recombination and Repair
- RNA Processing and Transcription
- Protein Synthesis, Folding, Localization and Quality Control
- 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**

www.asbmb.org/meeting2014

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